AREA 317 RCRA QUARTERLY
GROUND WATER MONITORING REPORT NO. 31
APRIL THROUGH JUNE 1996

WHITTAKER CORPORATION, BERMITE FACILITY
22116 WEST SOLEDAD CANYON ROAD
SANTA CLARITA, CALIFORNIA 91350
AME PROJECT NO. 21001.75

October 10, 1996

Prepared By

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October 10, 1996

Mr. Hamid Saebfar
Site Mitigation Branch, Region 3
Attn: Whittaker Project Manager
California Department of Toxic Substances Control
1011 North Grandview Avenue
Glendale, California 91201

21001.75/7

Subject: Area 317 RCRA Quarterly Ground Water Monitoring Report No. 31
April through June 1996, Whittaker Corporation, Bermite Facility
22116 West Soledad Canyon Road, Santa Clarita, California

Dear Mr. Saebfar:

Enclosed is the Area 317 RCRA Quarterly Ground Water Monitoring Report No. 31 for the second quarter, April through June 1996. The monitoring was completed according to the requirements of the Water Quality Monitoring and Response Plan for the Interim Status Area 317 Surface Impoundment.

The statistical analyses for this sampling event showed that the established tolerance limits for pH, specific conductance, chloride, sulfate, TCE, TOC, or TOX were not exceeded. The tolerance limit for sodium was exceeded for the sample from monitoring well MW-10.

Please call me at (916) 939-7550 if there are any questions regarding the enclosed report.

Sincerely,

ACTON • MICKELSON • ENVIRONMENTAL, INC.

Barbara J. Mickelson, P.E.
California Registered Professional Engineer #43417

BJM:ecd
Enclosure

cc/enc: Ms. Lynne M. O. Brickner, Esq., Whittaker Corporation (2 copies)
Mr. Glen AbdunNur, Whittaker Corporation, Bermite Division
Mr. Jose Ochoa, Los Angeles County Fire Department
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L96-377.ecd

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WHITTAKER CORPORATION, BERMITE FACILITY
22116 WEST SOLEDAD CANYON ROAD
SANTA CLARITA, CALIFORNIA 91350

1.0 INTRODUCTION

The Whittaker Corporation (Whittaker), Bermite facility (site) is located at 22116 West Soledad Canyon Road in Santa Clarita, California (Figure 1). Whittaker had interim status permits for 14 Resource Conservation and Recovery Act (RCRA) Hazardous Waste Management Units (HWMUs) when operations were terminated in April 1987. A document entitled "Whittaker Corporation, Bermite Division, Santa Clarita, California, CAD064573108, Facility Closure Plan Modifications" (Closure Plan), was prepared by Whittaker and approved by the California Environmental Protection Agency, Department of Toxic Substances Control (Cal-EPA) and U.S. Environmental Protection Agency (EPA) on December 28, 1987. The Closure Plan outlined procedures for obtaining approval by Cal-EPA and EPA of clean closure certification for the different HWMUs, including the 317 Surface Impoundment (Area 317).

The Closure Plan required the implementation of a ground water monitoring system at Area 317 capable of detecting and assessing the impact of the HWMU on the uppermost aquifer underlying Area 317. Implementation of a ground water monitoring system is described in the document entitled "Water Quality Monitoring and Response Plan for the Interim Status Area 317 Surface Impoundment," dated October 9, 1992 (Area 317 Monitoring Plan). This is a revised response plan approved by Cal-EPA which meets the requirements of the revisions to Title 22 and expands the constituents sampled and reported. The revised Area 317 Monitoring Plan was utilized for the nineteenth and subsequent sampling events.

A total of six ground water monitoring wells (MW-1, MW-3, MW-4, MW-5, MW-6, and MW-10) have been installed around Area 317 (Figure 2). Reports detailing the location and construction of monitoring wells, sampling and analysis plans for collecting and analyzing ground water samples from the ground water monitoring wells, abandonment of monitoring well MW-4, and quarterly sampling results which have been submitted to Cal-EPA and EPA are listed in Appendix A.

Quarterly ground water sampling activities were initiated on October 3, 1988, for monitoring wells MW-1, MW-3, and MW-4. The ground water monitoring program included analyses of water samples for volatile organic compounds (VOCs). Laboratory analytical results from the third quarterly sampling event reported trichloroethene (TCE) at 4,800 micrograms per liter (μg/l) in the ground water sample collected from monitoring well MW-4. As a result, two additional monitoring wells were installed in Area 317 (MW-5 and MW-6).

The fourth quarterly monitoring event included sampling of the ground water from monitoring wells MW-1, MW-3, and MW-4. Monitoring wells MW-5 and MW-6 were not equipped for sampling during the fourth quarterly sampling event. Analytical results from the fourth quarter were similar to those reported in the third quarterly sampling event. The concentrations of VOCs reported in samples collected from monitoring wells MW-1 and MW-3 were below laboratory reporting limits; however, analysis of the ground water sample collected from monitoring well MW-4 reported TCE at 7,200 $\mu g/l$. Analysis of ground water samples collected from monitoring well MW-4 during the fifth through twelfth quarterly sampling events reported a steady decline in TCE concentration. Based on the results of the initial four sampling events, a reduced list of chemical parameters, approved by Cal-EPA, was utilized for the fifth through eighteenth quarterly sampling events.

Statistical analysis of indicator parameters was initiated during the fifth quarterly sampling event. The ground water samples collected and analyzed for indicator parameters from monitoring wells MW-1, MW-3, and MW-4 for the initial year of monitoring were evaluated to assess whether statistically significant changes to the ground water had occurred as a result of site activities.

A Comprehensive Ground Water Monitoring Evaluation (CME) was conducted by Cal-EPA on January 24 and 25, 1990, during the sixth quarterly monitoring event. Personnel from Cal-EPA were present during all phases of the sixth quarterly monitoring event, from the taking of initial potentiometric surface elevation measurements to the sealing of the coolers containing the quarterly ground water samples.

For the thirty-first quarterly monitoring event, ground water samples from monitoring wells MW-1, MW-3, MW-5, and MW-6 were collected on June 26, 1996. A pump discharge line malfunctioned during development of well MW-10. Well MW-10 was developed a second time after repairs were completed and sampled on June 28, 1996. This report presents the results of the thirty-first quarterly ground water sampling event, along with recommendations for future quarterly ground water sampling events.

2.0 GROUND WATER LEVEL MEASUREMENTS

Water level measurements were taken on June 24, 1996, prior to well evacuation and sampling activities. Monitoring well locations with respect to Area 317 are shown on Figure 2. Water levels were measured to the nearest 0.01 foot. Water level elevations decreased 1.78, 1.89, 2.76, 2.45, and 2.38 feet in monitoring wells MW-1, MW-3, MW-5, MW-6, and MW-10, respectively, between the thirtieth and thirty-first quarters. Table 1 summarizes potentiometric surface elevation data for monitoring wells in Area 317. Figure 3 illustrates the historic changes in potentiometric surface elevations in monitoring wells MW-1, MW-3, MW-5, MW-6, and MW-10.

The June 24, 1996, water level measurements were used to develop the potentiometric surface contours illustrated on Figure 2. Figure 2 indicates that the inferred flow direction for June 24, 1996, is toward the north-northeast. Based on these data, monitoring wells MW-6 and MW-10 are estimated to be located hydraulically downgradient from Area 317, monitoring well MW-5 is estimated to be located hydraulically downgradient and/or crossgradient from Area 317, monitoring well MW-1 is estimated to be located hydraulically crossgradient and/or upgradient from Area 317, and monitoring well MW-3 is estimated to be located hydraulically upgradient from Area 317. The ground water flow direction estimated for June 24, 1996, is similar to the flow direction estimated for the previous sampling event. The estimated ground water flow direction has varied from north-northwest to north-northeast since initiating quarterly ground water monitoring, possibly contributing to the reported variability in ground water chemistry.

3.0 SAMPLE COLLECTION AND ANALYSES

Ground water evacuation, stabilization, and sampling procedures are outlined in Appendix B.

3.1 Required Ground Water Analyses

For the thirty-first sampling event, the following analytical parameters were tested according to the Area 317 Monitoring Plan:

- Ground Water Monitoring Parameters: pH, specific conductance, total organic carbon (TOC), total organic halogens (TOX), TCE, sulfate, sodium, manganese, iron, and chloride.

Background water quality parameters were not analyzed for the thirty-first sampling event based on the results from previous sampling events.

All ground water samples collected during the thirty-first sampling event were submitted to FGL Environmental (FGL) in Santa Paula, California. FGL is certified by Cal-EPA to perform the ground water analyses outlined in the Area 317 Monitoring Plan. Chain-of-custody and sample analyses request forms are included in Appendices C and D, respectively. A description of FGL's Quality Assurance/Quality Control (QA/QC) program is provided in Appendix E. Copies of the laboratory analytical reports for all trip, field, and method blanks, and duplicate and spiked samples analyzed by FGL are provided in Appendix F.

3.2 Approved Analytical Methods

Ground water monitoring parameters were analyzed by EPA or other approved methodologies. Analytical methodologies were presented in the "Ground Water Sampling and Analysis Plan," dated August 1988. Modifications to this plan were approved by Cal-EPA prior to the fifth quarterly sampling event. Copies of the laboratory test method protocol were included in Appendix B of "Quarterly Sampling Report No. 1," dated December 1988.

A summary of sample volumes, sample containers, and laboratory analytical methods utilized during the thirty-first sampling event is presented in Table B-3, Appendix B. Procedures regarding sample containers, sample labeling, sample collection, and field QA/QC are outlined in Appendix B.

4.0 GROUND WATER SAMPLE ANALYTICAL RESULTS

4.1 Ground Water Monitoring Parameters

Ground water samples from each monitoring well were analyzed for pH, specific conductance, chloride, iron, manganese, sodium, sulfate, TCE, TOC, and TOX to serve as ground water monitoring parameters. Table 2 summarizes the results of the ground water monitoring parameter analyses for the thirty-first sampling event, along with results from the previous four sampling events. Copies of the original laboratory reports are presented in Appendix G.

Laboratory pH measurements of 7.7, 7.9, 7.7, 7.7, and 7.7 were recorded for samples collected from monitoring wells MW-1, MW-3, MW-5, MW-6, and MW-10, respectively, for the thirty-first monitoring event. The laboratory pH measurements recorded for samples collected from the monitoring wells during the thirty-first sampling event are generally consistent with the measurements recorded during previous sampling events.

Specific conductance measurements of 760, 600, 520, 570, and 600 micromhos per centimeter squared (μmhos/cm^2) were recorded for samples collected from monitoring wells MW-1, MW-3, MW-5, MW-6, and MW-10, respectively, for the thirty-first sampling event. The specific conductance measurements recorded during the thirty-first sampling event are generally consistent with measurements recorded during previous sampling events. The results for chloride, sodium, and sulfate were 150, 53, and 13 milligrams per liter (mg/l) for the sample from monitoring well MW-1; 31, 61, and 78 mg/l for the sample from monitoring well MW-3; 50, 55, and 34 mg/l for the sample from monitoring well MW-5; 70, 56, and 34 mg/l for the sample from monitoring well MW-6; and 70, 80, and 43 mg/l for the sample from monitoring well MW-10. Laboratory results for iron were <50 μg/l for the ground water samples collected from each of the five monitoring wells for the thirty-first sampling event. The results for iron, sodium, chloride, and sulfate are generally consistent with results from previous sampling events.

The concentration of manganese in samples collected during the thirty-first sampling event ranged from 1.3 μg/l in the sample collected from monitoring well MW-6 to 3.3 μg/l in the sample collected from monitoring well MW-3.

Laboratory analytical results for samples collected from Area 317 monitoring wells during the thirty-first sampling event did not indicate the presence of TCE, TOC, or TOX at method detection limits of 0.5 μg/l, 0.5 mg/l, and 5 μg/l, respectively. Trip blanks and field blanks prepared during sampling at well MW-6 were also non-detect for TCE, TOC, and TOX. These analytical results are consistent with results from previous sampling events.

4.2 Background Water Quality Parameters

Background water quality parameters were not tested during the present monitoring event. The background water quality parameters were last tested during the twenty-third monitoring event because of a third consecutive exceedance with respect to the tolerance limit established for sodium. A summary of historical background water quality parameters is presented in Table 3.

5.0 STATISTICAL ANALYSIS OF RESULTS TO DATE

As was indicated in the document entitled "Ground Water Sampling and Analysis Plan," dated August 1988, and required in 40 CFR Part 265.92, statistical analysis of the indicator parameters was previously performed to determine whether a statistically significant difference in the water quality existed between the individual downgradient monitoring wells and the upgradient or background monitoring wells. At that time, monitoring wells MW-1 and MW-3 were considered upgradient or crossgradient relative to Area 317, and monitoring wells MW-5, MW-6, and MW-10 were considered downgradient or crossgradient relative to Area 317.

After four quarters of sampling and analysis of the monitoring system, the mean, standard deviation, variance, and coefficient of variance of the four indicator parameters were calculated. These values were reported to Cal-EPA in correspondence to Mr. Alan Sorsher, P.E., Cal-EPA, from Wenck Associates, Inc. (Wenck), dated October 25, 1989. The statistical analysis, presented in the fifth through tenth quarterly sampling reports, indicated only one statistically significant difference in water quality as determined by the indicator parameters. This was interpreted by Wenck to be caused by erroneous TOC results from the sixth quarter.

Since the approval of the Area 317 Monitoring Plan by Cal-EPA, the statistical comparison of analytical results for each downgradient monitoring well is made against the tolerance limits calculated from upgradient monitoring well results for the ten ground water monitoring parameters (chloride, sulfate, iron, manganese, sodium, TCE, TOC, TOX, specific conductance, and pH). The tolerance limits for the ground water monitoring parameters will be updated at a minimum annually to include the latest analytical data.

Concentrations of the ground water monitoring parameters in the ground water samples collected from Area 317 monitoring wells for the thirty-first quarter are included in Table H-1, presented in Appendix H. A summary of the quarterly statistics for each background monitoring well and the tolerance limit calculations for the ground water monitoring parameters are presented in Appendix H, Tables H-2, H-3, and H-4. Graphical presentation of the statistical information is also included in Appendix H.

5.1 Assumptions Used in the Statistical Analysis

As recommended in the document entitled "RCRA Ground Water Monitoring Technical Enforcement Guidance Document," the data points that are less than the detection limit have been given a value equal to one-half the detection limit of the analyte. As recommended in the document entitled "Statistical Analysis of Ground Water Monitoring Data at RCRA Facilities, Interim Final Guidance" (Guidance Document), the statistical analysis assumes a value for the confidence coefficient (1-a) of 0.95 and a value for the proportion (y) of 0.95. This translates to a 95 percent confidence that 95 percent of future background monitoring well results will fall within the tolerance interval predicted. The tolerance limits for pH were calculated using a two-tailed distribution, and the tolerance limits for the other parameters were calculated using a one-tailed distribution. It was assumed that the data are distributed normally.

5.2 Data Preparation

The ground water sample analytical results from the two background or upgradient monitoring wells (MW-1 and MW-3) for all thirty-one quarters of ground water sampling to date, and the results for the three downgradient monitoring wells (MW-5, MW-6, and MW-10) for the thirty-first quarter of ground water sampling, have been tabulated and prepared for statistical analysis. In accordance with the tolerance limit methodology used for this statistical analysis, the analytical results for the ten ground water monitoring parameters are summarized by quarter and by monitoring well. Arithmetic mean and standard deviation summary statistics have been calculated from background monitoring well results and are utilized in calculating the tolerance limits for each of the ground water monitoring parameters.

The statistical analysis for the ground water monitoring parameters requires a statistical comparison using tolerance intervals between water quality downgradient of Area 317 (wells MW-5, MW-6, and MW-10) and background water quality (wells MW-1 and MW-3). Tolerance intervals for each of the ten water quality parameters are based on the average of all the quarterly monitoring data for background wells MW-1 and MW-3. The most recent quarterly monitoring data for each downgradient well is compared to the established tolerance interval for each parameter to determine if an exceedance has occurred (Table H-1).

The calculations of the quarterly statistics were performed as outlined in the Area 317 Monitoring Plan. The values of K were taken from the statistical tables based on the number of samples and a one-sided tolerance limit. Note that pH values have not been reported as hydrogen ion concentrations as was done previously and that the value of K for the analysis of pH is derived from the tables for two-sided tolerance limits. TCE has never been reported above the detection limit in samples from monitoring wells MW-1 and MW-3; therefore, the tolerance limit for TCE is set at the detection limit.

5.3 Results

The thirty-first quarter results for each ground water monitoring parameter at each downgradient monitoring well were compared to the tolerance limits based on the first through thirty-first quarter results for background monitoring wells MW-1 and MW-3. The statistical analysis indicates that there is no excursion of tolerance limits of pH, specific conductance, chloride, sulfate, iron, manganese, sodium, TCE, TOC, or TOX in downgradient ground water quality, except for sodium in the sample from monitoring well MW-10. In the past, an elevated sodium concentration in monitoring well MW-10 relative to sodium concentrations in the other four Area 317 wells has not indicated a statistical impact to ground water quality, based on the concentrations of the other ground water monitoring parameters and retesting of background water quality parameters.

6.0 SUMMARY OF RESULTS, APRIL THROUGH JUNE 1996

6.1 Ground Water Level Measurements

The estimated direction of ground water flow based on the June 24, 1996 data is toward the north-northeast, which is consistent with the ground water flow direction estimated during the previous sampling event. Utilizing this data, monitoring wells MW-6 and MW-10 are estimated to be located hydraulically downgradient from Area 317; monitoring well MW-5 is estimated to be located hydraulically downgradient and/or crossgradient from Area 317; monitoring well MW-1 is estimated to be located hydraulically crossgradient and/or upgradient from Area 317; and monitoring well MW-3 is estimated to be located hydraulically upgradient from Area 317.

6.2 Ground Water Monitoring Parameters

The pH reported in samples from four of the five monitoring wells was 7.7. The pH reported for the sample collected from MW-3 was 7.9. The specific conductance in samples from the five monitoring wells ranged from 520 μmhos/cm^2 (monitoring well MW-5) to 760 μmhos/cm^2 (monitoring well MW-1). TOC was reported at less than 0.5 mg/l, and TOX was reported at less than 5 μg/l in samples from all five monitoring wells. The pH, specific conductance, TOC, and TOX results reported for the thirty-first sampling event are generally consistent with the results reported for the previous sampling events.

TCE, the constituent of concern for Area 317, was not present in any of the samples collected during the thirty-first sampling event.

The ground water sample analytical results for chloride, iron, manganese, sodium, and sulfates from the five monitoring wells are generally consistent with historic data. All are under the tolerance limits, except for sodium in the sample from monitoring well MW-10.

6.3 Background Water Quality Parameters

Background water quality parameters were not tested in this quarter. If tolerance limits for any water quality parameters are exceeded for three consecutive monitoring events, then additional samples will be collected during the subsequent monitoring event and analyzed for the background water quality parameters. The tolerance limit for sodium was exceeded for the eighth consecutive quarter in the sample from monitoring well MW-10. Acton • Mickelson • Environmental, Inc. (AME), proposes that no further background water quality parameters be tested due to this exceedance at this time. The elevated sodium concentrations in the samples from monitoring well MW-10 in comparison to concentrations reported for background wells has not indicated an impact with respect to the other ground water quality parameter concentrations. During the twenty-third monitoring event, all six background parameters were analyzed due to the exceedance of the tolerance limit for sodium in the sample from monitoring well MW-10. Analysis of the data indicated that the concentrations of background water quality parameters were consistent with the historical data for these parameters in samples from upgradient wells MW-1 and MW-3.

6.4 Statistical Analysis

The analytical results from the thirty-first quarter sampling event indicate that values for pH, specific conductance, chloride, sulfate, iron, manganese, sodium (monitoring wells MW-5 and MW-6), TCE, TOC, and TOX in the downgradient monitoring wells are within the tolerance limits set by calculations using historical results from the background monitoring wells. The only tolerance limit exceeded was sodium for the sample from monitoring well MW-10.

7.0 RECOMMENDATIONS

The following recommendations are presented:

- Conduct future sampling events in accordance with the procedures set forth in the document entitled "Water Quality Monitoring and Response Plan for the Interim Status Area 317 Surface Impoundment," dated October 9, 1992.

- Update the tolerance limits for the ground water monitoring parameters following the thirty-second quarterly sampling event.

8.0 REMARKS

The recommendations contained in this report represent our professional opinions. These opinions are based on currently available information and were developed in accordance with currently accepted hydrogeologic and engineering practices at this time and location. Other than this, no warranty is implied or intended.

TABLE 1

POTENTIOMETRIC SURFACE ELEVATIONS
RCRA GROUND WATER MONITORING WELLS
WHITTAKER CORPORATION, BERMITE FACILITY

Well No.	MW-1	MW-3	MW-4	MW-5	MW-6	MW-10
Top of Casing Elevation[a]	1,561.32	1,538.51	1,538.43	1,493.37	1,521.09	1,537.49
Date	Potentiometric Surface Elevations[a]					
12/23/87	1,107.81	--[b]				
01/27/88	1,108.03	1,109.51				
02/03/88	1,108.32	1,109.88				
02/04/88	1,108.36	1,109.14				
02/05/88	1,108.36	1,109.17				
02/09/88	1,108.24	1,109.13				
02/10/88	1,108.28	1,109.27				
02/12/88	1,108.28	1,109.27				
02/19/88	1,108.11	1,108.86				
03/28/88	1,107.69	1,108.23				
04/05/88	1,107.76	1,108.23				
04/12/88	1,107.66	1,108.23				
04/19/88	1,107.56	1,108.23				
04/26/88	1,107.61	1,108.23				
05/02/88	1,107.86	1,108.23				
07/27/88	1,103.58	1,104.19	1,102.61			
10/03/88	1,101.75	1,102.11	1,100.77			
01/23/89	1,099.82	1,100.25	1,098.92			
04/17/89	1,097.37	1,097.62	1,096.05			
07/27/89	1,094.67	1,094.85	1,093.53	1,093.02	1,093.15	
08/10/89	1,093.93	1,094.09	1,092.89	1,092.32	1,092.49	
08/18/89	1,093.62	1,093.76	1,092.64	1,092.03	1,092.19	
10/30/89	1,092.07	1,092.16	1,091.08	1,090.62	1,090.64	
01/24/90	1,090.56	1,090.54	1,089.68	1,089.17	1,089.50	
04/16/90	1,088.66	1,088.78	1,087.83	1,087.23	1,087.32	
07/16/90	1,083.56	1,083.53	1,082.29	1,081.41	1,081.85	
10/17/90	1,079.91	1,079.78	1,078.86	1,078.25	1,078.56	
01/28/91	1,076.52	1,076.54	1,075.46	1,074.64	1,074.91	
04/22/91	1,071.22	1,071.29	1,069.75	1,068.90	1,069.25	
07/17/91	1,063.63	1,063.79	1,061.66	1,060.53	1,061.14	
10/08/91	1,055.22	1,055.41	1,053.28	1,052.12	1,052.69	
01/29/92	1,051.88	1,052.29	1,050.63	1,049.76	1,050.06	1,050.57
04/20/92	1,050.47	1,050.88	1,049.33	1,048.78	1,048.92	1,049.37
07/28/92	1,046.84	1,047.40	--[c]	1,045.14	1,045.20	1,045.77
10/19/92	1,043.87	1,044.58	--[c]	1,042.05	1,042.13	1,042.77
01/25/93	1,044.79	1,045.61	--[c]	1,044.22	1,043.64	1,044.29
06/07/93	1,049.24	1,050.36	--[c]	1,049.19	1,048.70	1,049.21
09/20/93	1,052.40	1,054.11	--[c]	1,052.47	1,051.79	1,052.53
12/06/93	1,054.26	1,056.27	--[c]	1,054.29	1,053.58	1,054.53
03/07/94	1,057.58	1,059.63	--[c]	1,057.69	1,056.92	1,057.77
06/21/94	1,056.22	1,058.38	--[c]	1,055.41	1,054.93	1,055.86
09/13/94	1,053.94	1,056.25	--[c]	1,052.79	1,052.44	1,053.43
12/12/94	1,054.62	1,056.79	--[c]	1,054.00	1,053.55	1,054.50
03/27/95	1,059.54	1,061.45	--[c]	1,059.80	1,059.28	1,059.89
06/26/95	1,060.73	1,062.97	--[c]	1,060.35	1,059.87	1,060.82
09/08/95	1,061.46	1,063.59	--[c]	1,061.06	1,060.66	1,061.58
12/04/95	1,064.21	1,066.41	--[c]	1,064.15	1,063.65	1,064.51
03/18/96	1,068.60	1,070.83	--[c]	1,068.75	1,067.99	1,068.99
06/24/96	1,066.82	1,068.94	--[c]	1,065.99	1,065.54	1,066.61

[a]NGVD = National Geodetic Vertical Datum.
[b]Measurement not recorded.
[c]Monitoring well abandoned 05/28/92.

TABLE 2

GROUND WATER MONITORING PARAMETER ANALYTICAL RESULTS
(JUNE 27, 1995 THROUGH JUNE 28, 1996)

Monitoring Well	Date	pH	Specific Conductance (µmhos/cm²)	Chloride (mg/l)	Iron (µg/l)	Manganese (µg/l)	Sodium (mg/l)	Sulfate (mg/l)	TCE[a] (µg/l)	TOC[b] (mg/l)	TOX[c] (µg/l)
MW-1	06/27/95	7.4	760	170	50	2.8	45	13	<0.5	<0.5	10
	09/12/95	7.5	780	160	90	3	53	12	<0.5	<0.5	6
	12/6-8/95	6.9	780	180	<50	2.7	50	12	<0.5	<0.5	<5
	03/20/96	7.4	770	180	<50	2.1	51	13	<0.5	<0.5	<5
	06/26/96	7.7	760	150	<50	2.1	53	13	<0.5	<0.5	<5
MW-3	06/27/95	7.6	620	32	<50	0.6	53	76	<0.5	<0.5	7
	09/12/95	7.6	620	34	<50	<1	53	73	<0.5	<0.5	<5
	12/6-8/95	7.5	620	29	<50	<0.5	54	77	<0.5	<0.5	<5
	03/20/96	7.6	610	35	<50	<0.5	57	91	<0.5	<0.5	<5
	06/26/96	7.9	600	31	<50	3.3	61	78	<0.5	<0.5	<5
MW-5	06/27/95	7.7	540	47	80	4.3	49	35	<0.5	<0.5	<5
	09/12/95	7.7	540	42	130	2	51	30	<0.5	<0.5	<5
	12/6-8/95	7.6	550	46	<50	1.3	52	31	<0.5	<0.5	<5
	03/20/96	7.6	540	57	<50	1.6	55	36	<0.5	<0.5	<5
	06/26/96	7.7	520	50	<50	1.5	55	34	<0.5	<0.5	<5
MW-6	06/27/95	7.7	570	67	140	3.0	45	34	<0.5	<0.5	10
	09/12/95	7.7	580	61	120	3	52	29	<0.5	<0.5	<5
	12/6-8/95	7.5	580	70	100	2.2	51	32	<0.5	<0.5	<5
	03/20/96	7.6	560	76	<50	1.4	53	29	<0.5	<0.5	<5
	06/26/96	7.7	570	70	<50	1.3	56	34	<0.5	<0.5	<5
MW-10	06/27/95	7.8	610	68	70	4.4	76	41	<0.5	<0.5	10
	09/12/95	7.8	620	65	90	3	78	36	<0.5	<0.5	6
	12/6-8/95	7.5	620	76	<50	3.1	79	42	<0.5	<0.5	<5
	03/20/96	7.8	610	83	<50	1.7	82	45	<0.5	<0.5	<5
	06/28/96	7.7	600	70	<50	1.8	80	43	<0.5	<0.5	<5

[a]TCE = Trichloroethene.
[b]TOC = Total organic carbon.
[c]TOX = Total organic halogens.

R96-008.eod

TABLE 3

BACKGROUND WATER QUALITY PARAMETERS

Well No.	Date Sampled	Gross Alpha (pCi/l)	Gross Beta (pCi/l)	Lead (mg/l)	Fluoride (mg/l)	Nitrate (mg/l)	Turbidity (NTUs)
Detection Limits				0.01[a] 0.0002	0.1	0.4	0.2
MW-1	10/04/88	0.4 ± 2	0.7 ± 2	<0.01	--[b]	--	--
	01/27/93	0 ± 1	4 ± 2	<0.01	0.2	--	--
	06/09/93	0.4 ± 1	0.7 ± 2	<0.01	0.2	3.9	0.4
	07/14/93	2 ± 2	0 ± 2	<0.01	0.4	4.8	0.9
	08/11/93	1 ± 1	4 ± 4	<0.01	0.3	4.8	0.9
	09/22/93	--	--	--	--	--	0.5
	03/10/94	--	--	--	--	ND	--
	06/22/94	2 ± 2	4 ± 2	<0.0002	0.2	3.6	1.0
MW-3	10/04/88	0.7 ± 1	2 ± 3	<0.01	--	--	--
	01/27/93	0.8 ± 1	2 ± 2	<0.01	0.3	--	--
	06/09/93	2 ± 1	1 ± 2	<0.01	0.2	1.6	<0.2
	07/14/93	2 ± 2	1 ± 2	<0.01	0.3	2.1	<0.2
	08/11/93	4 ± 2	3 ± 4	<0.01	0.2	2.2	0.3
	09/22/93	--	--	--	--	--	<0.2
	03/10/94	--	--	--	--	1.4	--
	06/22/94	1.0 ± 1	2 ± 2	4.9	0.2	3.6	0.3
MW-5[c]	06/22/94	1.0 ± 1	3 ± 2	<0.0002	0.2	3.6	0.9
MW-6[c]	06/22/94	0.1 ± 1	2 ± 2	<0.0002	0.2	3.8	0.8
MW-10[c]	06/22/94	0.4 ± 1	4 ± 2	<0.0002	0.2	3.7	0.8

[a]Detection limit lowered from 0.01 to 0.0002 mg/l on 6/22/94.
[b]Sample was not taken.
[c]Samples collected from monitoring wells MW-5, MW-6, and MW-7 during the twenty-third sampling event were analyzed for the background water quality parameters because of a repeated tolerance interval exceedence for sodium during previous sampling events.

EXPLANATION:

APPROXIMATE SITE LOCATION BOUNDARY

General Notes

Base Map from U.S.G.S.
MINT CANYON, AND NEWHALL CALIFORNIA
7.5 Minute Topographic
Quadrangle
Photorevised 1988

NORTH

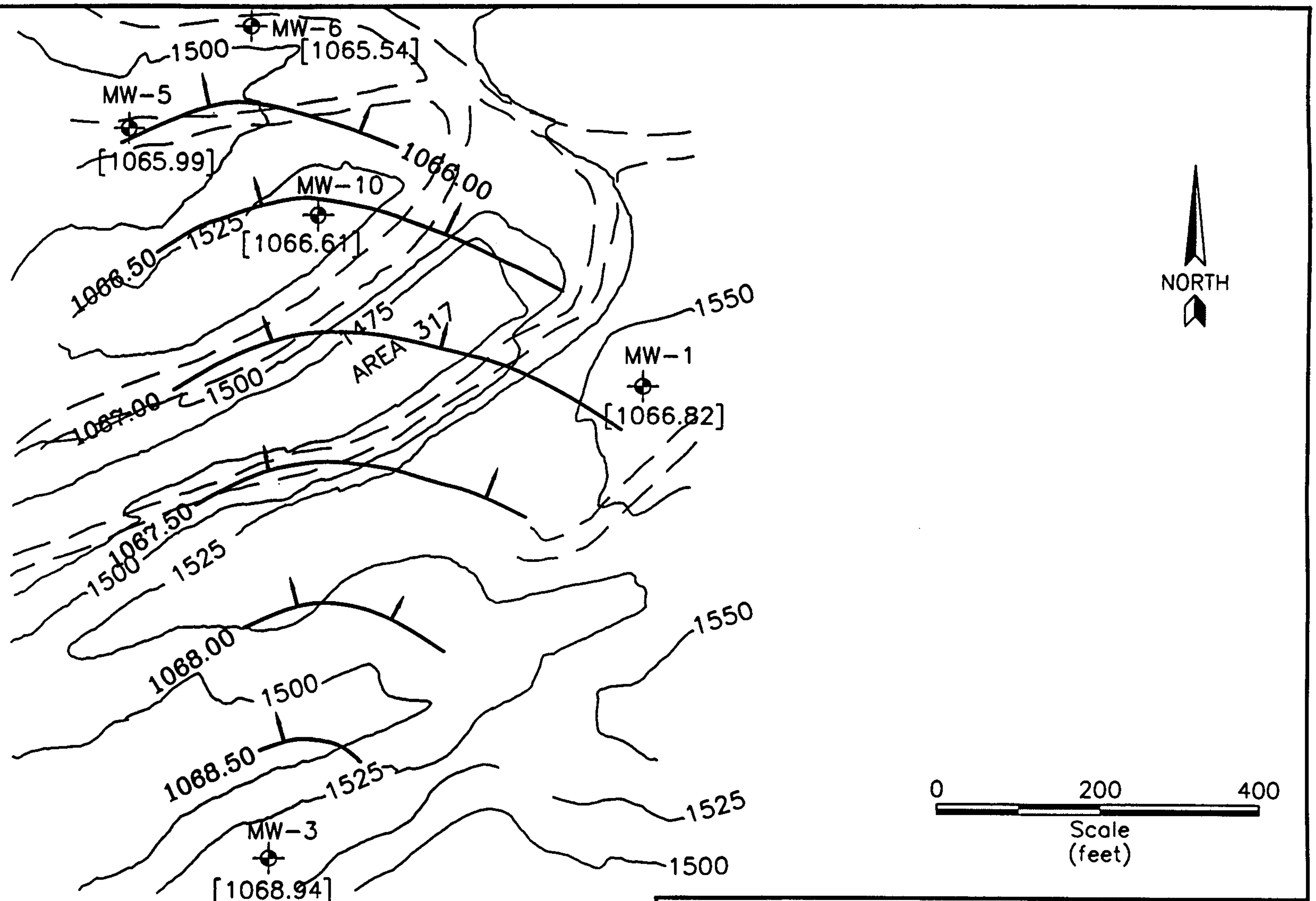
QUADRANGLE LOCATION

0 2,000
Approximate Scale
(in feet)

FIGURE 1

SITE LOCATION MAP
WHITTAKER CORPORATION, BERMITE FACILITY
22116 WEST SOLEDAD CANYON ROAD
SANTA CLARITA, CALIFORNIA

Project No. 21001	Drawn CCB	Acton • Mickelson • Environmental, Inc. Consulting Scientists, Engineers, and Geologists
File No. SD101SLM	Prepared PHB	4511 Golden Foothill Parkway, #1 El Dorado Hills, California 95762
Revision 0	Reviewed	(916) 939-7550



LEGEND

MW-1 — MONITORING WELL LOCATION

[1066.82] — GROUND WATER ELEVATION (FEET ABOVE MEAN SEA LEVEL)

1068.00 — ESTIMATED GROUND WATER CONTOUR (FEET ABOVE MEAN SEA LEVEL) WITH ARROW INDICATING INFERRED DIRECTION OF GROUND WATER FLOW

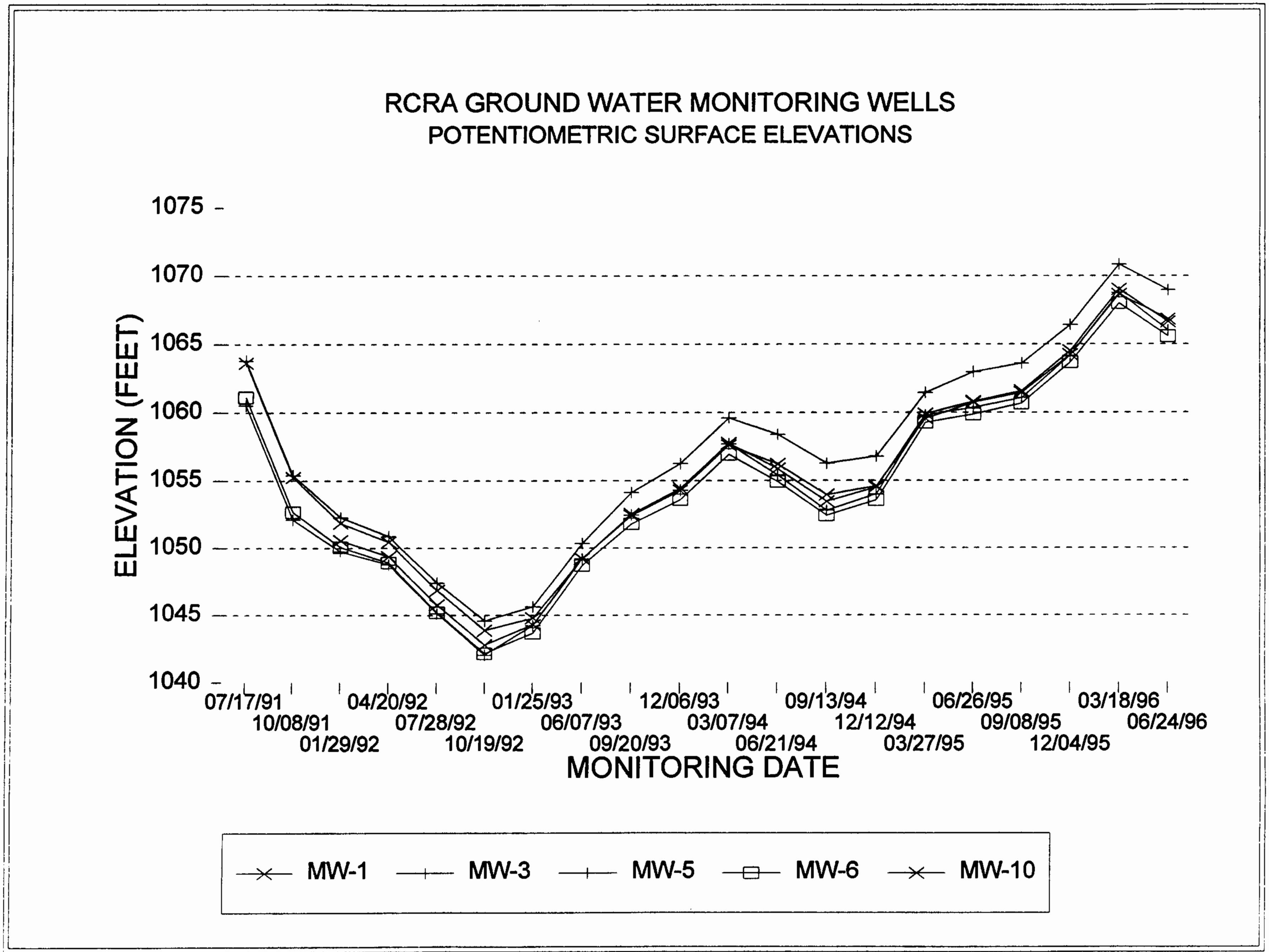
FIGURE 2

AREA 317 GROUND WATER MONITORING WELL LOCATIONS AND ESTIMATED GROUND WATER FLOW DIRECTION (06/24/96)

WHITTAKER CORPORATION, BERMITE FACILITY
22116 WEST SOLEDAD CANYON ROAD,
SANTA CLARITA, CALIFORNIA

Project No.	Drawn	
21001.75	DWR	Acton • Mickelson • Environmental, Inc. Consulting Scientists, Engineers, and Geologists
File No.	Prepared	
QM36WTC2	8/9/96 LGP	4511 Golden Foothill Parkway, #1 El Dorado Hills, California 95762 (916) 939-7550
Revision	Reviewed	
0		

FIGURE 5


RCRA GROUND WATER MONITORING WELLS
POTENTIOMETRIC SURFACE ELEVATIONS
ELEVATION (FEET)
1075
1070
1065
1060
1055
1050
1045
1040
07/17/91
10/08/91
01/29/92
04/20/92
07/28/92
10/19/92
01/25/93
06/07/93
09/20/93
12/06/93
03/07/94
06/21/94
09/13/94
12/12/94
03/27/95
06/26/95
09/08/95
12/04/95
03/18/96
06/24/96
MONITORING DATE
MW-1
MW-3
MW-5
MW-6
MW-10

APPENDIX A

DOCUMENT SUBMITTAL CHRONOLOGY

APPENDIX A

DOCUMENT SUBMITTAL CHRONOLOGY

The following documents have been submitted to Cal-EPA and U.S. EPA, Region IX, in fulfillment of the Closure Plan regarding ground water monitoring at Areas 317 and 342:

- Whittaker Corporation, Bermite Division, Santa Clarita, CA CAD064573108, Facility Closure Plan Modifications, April 1987.
- Revised Ground Water Monitoring Plan for the 317/342 Area, October 8, 1987.
- Proposed Interim Status Ground Water Monitoring Sampling and Analysis Program, December 1987.
- Documentation Report--Construction and Development of Wells for Ground Water Monitoring of the 342 and 317 Areas, February 1988.
- Verification Sampling Results at Selected RCRA Units, March 1988.
- RCRA Ground Water Monitoring System--Proposed Final Configuration, May 1988.
- Ground Water Sampling and Analysis Plan, August 1988.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 1, December 1988.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 2, March 1989.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 3, July 1989.
- Specific Plan for a Ground Water Quality Assessment Program, June 1989.
- Interim Response Action Plan, 317 Area Soil and Ground Water Remediation, June 1989.
- Site Ground Water Sampling and Analysis Plan, Appendix IV of 40 CFR 264.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 4, September 1989.

- Statistical Analysis--Well MW-2 Versus MW-1 and MW-3, October 1989.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 5, March 1990.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 6, May 1990.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 7, June 1990.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 8, October 1990.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 9, January 1991.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 10, April 1991.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 11, July 1991.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 12, October 1991.
- Specific Plan for a Ground Water Quality Assessment Program for the 317 Surface Impoundment Area.
- RCRA Ground Water Sampling, Quarterly Sampling Report No. 13, January 1992.
- Area 317 RCRA Quarterly Ground Water Quality Monitoring Report No. 14 and Report of Monitoring Well MW-10 Installation, January through March 1992.
- Area 317 RCRA Quarterly Ground Water Quality Monitoring Report No. 15, April through June 1992.
- Area 317 RCRA Quarterly Ground Water Quality Monitoring Report No. 16, July through September 1992.
- Water Quality Monitoring and Response Plan for the Interim Status Area 317 Surface Impoundment, October 1992.
- Area 317 RCRA Quarterly Ground Water Quality Monitoring Report No. 17, October through December 1992.
- Area 317 RCRA Quarterly Ground Water Monitoring Report No. 18, January through March 1993.
- Area 317 RCRA Quarterly Ground Water Monitoring Report No. 19, April through June 1993.

- Area 317 RCRA Quarterly Ground Water Monitoring Report No. 20, July through September 1993.
- Area 317 RCRA Quarterly Ground Water Monitoring Report No. 21, October through December 1993.
- Area 317 RCRA Quarterly Ground Water Monitoring Report No. 22, January through March 1994.
- Area 317 RCRA Quarterly Ground Water Monitoring Report No. 23, April through June 1994.
- Area 317 RCRA Quarterly Ground Water Monitoring Report No. 24, June through September 1994.
- Area 317 RCRA Quarterly Ground Water Monitoring Report No. 25, October through December 1994.
- Area 317 RCRA Quarterly Ground Water Monitoring Report No. 26, January through March 1995.
- Area 317 RCRA Quarterly Ground Water Monitoring Report No. 27, April through June 1995.
- Area 317 RCRA Quarterly Ground Water Monitoring Report No. 28, July through September 1995.
- Area 317 RCRA Quarterly Ground Water Monitoring Report No. 29, October through December 1995 and Annual 1995 Summary.
- Area 317 RCRA Quarterly Ground Water Monitoring Report No. 30, January through March 1996.

APPENDIX B

GROUND WATER SAMPLING PROCEDURES

TABLE B-1

AREA 317 WELL EVACUATION
WHITTAKER CORPORATION, BERMITE FACILITY

Well Number	Date Pump Started	Evacuation	Sampling[a]	Time and Date of Sample Collection
		Approximate Duration of Pumping (hours)	Duration of Pumping (minutes)	
MW-1	06-25-96	26	10	0850 (6-26-96)
MW-3	06-25-96	26	13	0902 (6-26-96)
MW-5	06-25-96	25.5	4	0826 (6-26-96)
MW-6	06-25-96	25	18	0805 (6-26-96)
MW-10	06-27-96[b]	25	10	0800 (6-28-96)

[a]Flow rate from wells was reduced prior to sampling.
[b]Second well stabilization period after completing pump repairs on 6-26-96.

TABLE B-2

WELL STABILIZATION TESTS
WHITTAKER CORPORATION, BERMITE FACILITY

Well	Time and Date	Temperature (°C.)	pH	Specific Conductance (μmhos)[a]/cm²	Turbidity (NTUs)[b]
MW-1	1050 (6-25-96)	23.7	7.74	750	4.57
	1520 (6-25-96)	23.2	7.68	762	2.97
	0720 (6-26-96)	22.5	7.35	759	1.61
MW-3	1055 (6-25-96)	24.1	7.78	595	4.08
	1525 (6-25-96)	23.9	7.63	614	1.82
	0725 (6-26-96)	23.4	7.45	608	1.32
MW-5	1040 (6-25-96)	23.5	7.79	535	2.42
	1510 (6-25-96)	23.1	7.78	547	2.13
	0710 (6-26-96)	22.7	7.44	545	1.69
MW-6	1035 (6-25-96)	23.5	7.81	572	7.81
	1505 (6-25-96)	23.5	7.88	572	5.27
	0705 (6-26-96)	22.6	7.50	575	3.47
MW-10	1045 (6-25-96)	23.4	7.83	596	6.76
	1515 (6-25-96)	23.4	7.67	619	3.79
	1115 (6-27-96)[c]	23.2	7.87	600	16.55
	1500 (6-27-96)	23.4	7.84	602	7.85
	0750 (6-28-96)	22.9	7.65	618	3.54

[a]μmhos - micromhos.
[b]NTUs - nephelometric turbidity units.
[c]Due to a pump discharge fitting failure during well stabilization, well MW-10 was developed a second time after pump repairs were completed on 6-26-96.

TABLE B-3

LABORATORY ANALYTICAL METHODS AND SAMPLE VOLUME
AND CONTAINER REQUIREMENTS
AREA 317 GROUND WATER MONITORING WELLS
WHITTAKER CORPORATION, BERMITE FACILITY

Constituent	Analytical Method	Sample Volume (milliliters)	Container Type
Ground Water Monitoring Parameters			
pH/Specific Conductance	4500-HB/2510B	500	Plastic/glass
Total Organic Carbon	EPA 415.1	250	Amber glass-TFE cap
Total Organic Halogen	EPA 9020	250	Amber glass-TFE cap
Trichloroethylene	EPA 624	3 x 40	Amber glass-TFE cap
Sulfate/Chloride	4110B	1000	Plastic/glass
Sodium/Iron/Manganese	200.7/200.8/200.7	1000	Plastic

APPENDIX C

CHAIN-OF-CUSTODY FORMS

N°

CHAIN OF CUSTODY RECORD

FIELD COORDINATOR: GLEN ABDUN-NUR

PROJ. NO.: 85-01.4

PROJECT NAME: 317 AREA BERMITE QUARTERLY WATER SAMPLING

SAMPLERS (Signature)

STA. NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NUMBER OF CONTAINERS	PRESERVED WITH H_2SO_4						REMARKS
													NO H/S on 6/24
MW1/A/31	6/24/96	0858		X	MONITORING WELL #1	1							
MW1/B/31	"	0852		X	"	1	X						
MW1/C/31	"	0853		X	"	1	X						
MW1/H/31	"	0854		X	"	1							
MW1/O/31	"	0850		X	"	3							
MW1/R/31	"	0856		X	"	1							
MW3/A/31	"	0912		X	MONITORING WELL #3	1							
MW3/B/31	"	0905		X	"	1	X						
MW3/C/31	"	0906		X	"	1	X						
MW3/H/31	"	0908		X	"	1							
MW3/O/31	"	0907		X	"	3							
MW3/R/31	"	0910		X	"	1							

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time	Received by: (Signature)
	6-26-96	1010					
Relinquished by: (Signature)	**Date**	**Time**	**Received by: (Signature)**	**Relinquished by: (Signature)**	**Date**	**Time**	**Received by: (Signature)**
	6/26/96	1108					

Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time	Remarks

Nº

CHAIN OF CUSTODY RECORD

FIELD COORDINATOR: GLEN ABDUN-NOR

PROJ. NO.: 85-01.4

PROJECT NAME: 317 AREA BERMITE QUARTERLY WATER SAMPLING

SAMPLERS (Signature):

STA NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NUMBER OF CONTAINERS	PRESERVED WITH H_2SO_4 < 2						REMARKS
													NO H/S on 624
MW5/A/31	6/24/96	0835		X	MONITORING WELL #5	1							
MW5/B/31	〃	0829		X	〃	1	X						
MW5/C/31	〃	0830		X	〃	1	X						
MW5/H/31	〃	0831		X	〃	1							
MW5/O/31	〃	0826		X	〃	3							
MW5/R/31	〃	0833		X	〃	1							
MW6/A/31	〃	0817		X	MONITORING WELL #6	1							
MW6/B/31	〃	0813		X	〃	1	X						
MW6/C/31	〃	0815		X	〃	1	X						
MW6/H/31	〃	0820		X	〃	1							
MW6/O/31	〃	0810		X	〃	3							
MW6/R/31	〃	0821		X	〃	1							

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time	Received by: (Signature)
	6-26-96	1010					
	6/26/96	1108					

Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time	Remarks

N.

CHAIN OF CUSTODY RECORD

FIELD COORDINATOR: GLEN ABDUN-NUR

PROJ. NO.: 85-01.4

PROJECT NAME: 317 AREA BERMITE QUARTERLY WATER SAMPLING

SAMPLERS (Signature): [signature]

STA. NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NUMBER OF CONTAINERS	PRESERVED WITH H_2SO_4 SP						REMARKS
													NO H/S on 6/24
w5/B/31 1A	6/24/96	0835		X	MONITORING WELL 5	1	X						
w5/C/31 1A	"	0836		X	"	1	X						
w5/D/31 1A	"	0837		X	"	3							
w6/B/31 1A	"	0822		X	MONITORING WELL 6	1	X						
w6/C/31 1A	"	0823		X	"	1	X						
w6/D/31 1A	"	0824		X	"	3							

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time	Received by: (Signature)
[signature]	6-26-96	1010	[signature]				
[signature]	6/26/96	1108	[signature]				

Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time	Remarks

Nº

2-4570 CHAIN OF CUSTODY RECORD SP605256

FIELD COORDINATOR GLEN ABDUN-NUR

PROJ. NO. 85-01.4

PROJECT NAME 317 AREA BERMITE QUARTERLY WATER SAMPLING

SAMPLERS (Signature) [signature]

LAB 6-28

STA NO.	DATE	TIME	COMP	GRAB	STATION LOCATION	NUMBER OF CONTAINERS	PH ADJUSTED WITH H2SO4 <2						REMARKS
MW10/A/31	6/27/96	0807		X	MONITORING WELL 10	1							
MW10/B/31	11	0802		X	11	1	X						
MW10/C/31	11	0803		X	11	1	X						
MW10/H/31	11	0805		X	11	1							
MW10/[illegible]/31	11	0808		X	11	3							
MW10/R/31	11	0806		X	11	1							

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time	Received by: (Signature)
[signature]	6-28-96	0815	[signature]				
[signature]	6/28/96	0924	[signature]				

Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time	Remarks
						REC'D JUL 1 1996

APPENDIX D

SAMPLE ANALYSES REQUEST FORMS

SAMPLE ANALYSIS REQUEST

Sampling Information

Project No. 85-01.4 Project Name: 317 AREA BERMITE QUARTERLY WATER SAMPLING

Sampler Name: GLEN ABDUN-NUR/TIM BRICKER Tele. No. (805) 259-2241

Name of Person Receiving Samples: Shelley Bobbitt

Date Samples Received: 4/26/94

Internal Temperature of Sample Container: 6

Notes on Samples:

Analysis Required

Sample I.D.	Laboratory I.D.	PH, EC	TOC	TOX	SULFATE, CHLORIDE	EPA 624 TCE ONLY	IRON, MANGANESE, SODIUM
MW1/A/31	SP 605182	X					
MW1/B/31	"		X				
MW1/C/31	"			X			
MW1/H/31	"				X		
MW1/G/31	"					X	
MW1/R/31	"						X
MW3/A/31	SP 605183	X					
MW3/B/31	"		X				
MW3/C/31	"			X			
MW3/H/31	"				X		
MW3/G/31	"					X	
MW3/R/31	"						X

SAMPLE ANALYSIS REQUEST

Sampling Information

Project No. 85-01.4 Project Name: BERMITE QUARTERLY WATER SAMPLING 317 AREA

Sampler Name: GLEN ABDUN-NUR/TIM BRICKER Tele. No. (805) 259-2241

Name of Person Receiving Samples: Shelley Bobbitt

Date Samples Received: 6/24/96

Internal Temperature of Sample Container: 6

Notes on Samples:

Analysis Required

Sample I.D.	Laboratory I.D.	PH, EC	TOC	TOX	SULFATE, CHLORIDE	EPA 624 TCE ONLY	IRON, MANGANESE SODIUM
MW5/A/31	SP 605184	X					
MW5/B/31	"		X				
MW5/C/31	"			X			
MW5/H/31	"				X		
MW5/O/31	"					X	
MW5/R/31	"						X
MW6/A/31	SP 605185	X					
MW6/B/31	"		X				
MW6/C/31	"			X			
MW6/H/31	"				X		
MW6/O/31	"					X	
MW6/R/31	"						X

SAMPLE ANALYSIS REQUEST

Sampling Information

Project No. 85-01.4 Project Name: BERNIE QUARTERLY WATER SAMPLING 317 AREA

Sampler Name: GLEN ABDUN-NUR/TIM BRICKER Tele. No. (805) 859-2241

Name of Person Receiving Samples: Shelley Bablott

Date Samples Received: 4/24/96

Internal Temperature of Sample Container: 0

Notes on Samples: ______________________

Sample I.D.	Laboratory I.D.	TOC	TOX	EPA 624 TCE ONLY			
MW5/B/31/1A	SP 605184	X					
MW5/C/31/1A	"		X				
MW5/D/31/1A	"			X			
MW6/B/31/1A	SP 605187	X					
MW6/C/31/1A	"		X				
MW6/D/31/1A	"			X			

SAMPLE ANALYSIS REQUEST

Sampling Information

Project No. 85-01.4 Project Name: BERMITE QUARTERLY WATER SAMPLE 317 AREA

Sampler Name: GLEN ABDUN-NUR/TIM BRICKER Tele. No. (805) 259-2241

Name of Person Receiving Samples: Gloria Summers

Date Samples Received: 6-28-96

Internal Temperature of Sample Container: Ø°C

Notes on Samples: N/A

SP605256
2-4570

Analysis Required

	Sample I.D.	Laboratory I.D.	(φ) 500 ML pH, EC	(φ) 250 ML amber TOC	(φ) 250 ML amber TOX	(φ) 1000 ML SULFATE, CHLORIDE	VOA NO HS EPA 624 TCE ONLY	(φ) 1000 ML IRON, MANGANESE, SODIUM
1	MW10/A/31		X					
2	MW10/B/31			X				
3	MW10/C/31				X			
4	MW10/H/31					X		
5	MW10/O/31						X	
6	MW10/R/31							X

APPENDIX E

FGL QUALITY ASSURANCE/QUALITY CONTROL PROGRAM

FGL ENVIRONMENTAL

ANALYTICAL CHEMISTS

Quality Assurance Manual

Corporate Offices & Laboratory
P.O. Box 272/853 Corporation Street
Santa Paula, CA 93061-0272
TEL: (805) 659-0910
FAX: (805) 525-4172

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209) 942-0181
FAX: (209) 942-0423

Field Office
Visalia, California
TEL: (209) 734-9473
Mobile: (209) 738-6273

QUALITY ASSURANCE MANUAL

FGL ENVIRONMENTAL
853 Corporation Street
Santa Paula, CA 93060

Reviewed by:____________________________ _____________
Dudley S. Jayasinghe, Ph.D. **Date**
Technical Director

Concurred by:____________________________ _____________
Kurt Wilkinson, B.S. **Date**
Quality Assurance Director

Approved by:____________________________ _____________
Darrell H. Nelson, B.S. **Date**
Laboratory Director

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QA Plan Description

The primary objective of FGL Environmental's quality assurance (QA) program is to ensure that all data is scientifically valid, defensible and of known precision and accuracy. Relative to the use for which the data are obtained, the data must be of sufficient known quality to withstand scientific and legal challenge.

This manual describes the overall approach used by FGL Environmental to ensure that the primary objective of the QA/QC program is met. It outlines quality control procedures to be used with field and analytical methods. It also outlines the individual analysis data quality objectives which will accomplish the primary objective. Detailed project-specific FGL standard operating procedures to supplement this manual are provided whenever requested.

FGL's QA manual is based on the 16 essential elements contained in the U.S. Environmental Protection Agency manual "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans," QAMS-005/80.

As of the date of revision, this manual reflects the current quality assurance program in effect and items in progress of being implemented.

References for this manual include field and laboratory methods published by the U.S. Environmental Protection Agency and other agencies mainly through the following sources:

(1) "Standard Methods for the Analysis of Water and Wastewater," 17th Edition, 1990.
(2) "Methods for Chemical Analysis in Waters and Waste," (MCAWW) EPA-600/4-79-020
(3) "Methods for the Determination of Organic Compounds in Drinking Water," EPA Method Book, EPA-600/4-88-039, December 1988.
(4) "Methods for the Determination of Organic Compounds in Drinking Water-Supplement I," EPA Method Book, EPA-600/4-90- 020, July 1990.
(5) "Methods for the Determination of Organic Compounds in Drinking Water-Supplement II," EPA Method Book, EPA-600/4- 90-020, July 1990.
(6) "Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater," EPA Method Book, EPA 600/4-82-057, July 1982.
(7) "Methods for Evaluating Solid Waste," EPA Method Book, SW- 846, rev. 3, and Proposed Revisions
(8) "Prescribed Procedures for Measurement of Radioactivity in Drinking Water," EPA Method Book, EPA-600/4-80-032, August 1980.
(9) "Handbook for Sampling and Sample Preservation of Water and Wastewater," EPA Method Book, EPA-600/4-82-029, September 1982.
(10) "Eastern Environmental Radiation Facility Radiochemistry Procedures Manual," EPA Method Book, EPA 520/5-84-006, August 1984.
(11) "Environmental Measurements Laboratory Procedures," HASL-300, 27th Edition, February 1992.

Laboratory Organization and Responsibilities

Personnel of FGL Incorporated

Our commitment to providing a superior service requires the high caliber staff employed by FGL. These professionals have considerable experience to meet the technical demand of environmental analysis.

<u>Santa Paula</u>	
Darrell H. Nelson, B.S.	President & Lab Director
Kurt Wilkinson, B.S.	Vice-President and Quality Assurance Director
Denis Barry, B.Comm.	Marketing Director
Cheryl Long	Administrative Services Director
Dudley S. Jayasinghe, Ph.D.	Technical Director
Roger Perry, B.A.	Health & Safety Officer
Eric Cotting, M.S.	Radiation Safety Officer
Kurt Wilkinson, B.S.	Inorganic Lab Manager
Randy Johnson	Trace Metals Supervisor
Mike Schraml, B.S.	Environmental Chemist
Shelli Perry, B.S.	Environmental Chemist
Christine Sullivan, B.S.	Wet Chemistry Supervisor
Christy Masyr, B.S.	Environmental Chemist
Katy Prusso, B.S.	Environmental Chemist
Kelly Dunnahoo, B.S.	Organic Lab Manager
Mark Bolyanatz, B.S.	Environmental Chemist
Rick Dotts, B.S.	Environmental Chemist
Sarah Edmondson, B.A.	Environmental Chemist
Dudley S. Jayasinghe, Ph.D.	Environmental Chemist
Juan M. Magana, B.S.	Environmental Chemist
Roger Perry, B.S.	Environmental Chemist
Michel Franco, B.A.	Radioactivity Lab Manager
Laura Reed	Lab Technician
Ricardo Sandoval, B.S.	Agricultural Lab Manager
Joan McKinney	Lab Technician
Raquel Harvey	Bacteriologist
Janelle Nelson	Bacteriologist
George Trouw	Field Services Director
Scott Bucy, B.S.	Field Services/Agronomist
Carl Tashima	Field Services
Jamie Johnson	Field Services
Pete Munoz	Field Services
Vickie Hengehold	Field Services
Eric Cotting, M.S.	Computer Programmer
Gary Hornbeck	Computer Programmer
Eva Anda, Ph.D.	Computer Programmer

Laboratory Organization and Responsibilities

Personnel continued

Santa Paula continued	
Beverly Baca	Accounting
Cindy Aguirre	Accounting
Cheryl Long	Administrative Services Director
Kristie Marlow	Customer Services Manager
Tiffany Douglas	Customer Services
Martha Hamblin	Customer Services
Erin Hart	Customer Services
Tonya Lawson	Customer Services
Cathy Metelak	Customer Services
Shawn Parham	Customer Services
Vickie Taylor	Customer Services
Stacey Berrington	Sample Receiving
Stockton	
Thomas M. Bartanen, M.S.	Lab Director and Quality Assurance Officer
Mark Ketcherside, B.S.	Inorganic Lab Manager
Mary Laing, B.S.	Environmental Chemist
William Little, B.S.	Environmental Chemist
Madelyn Taasin	Technician
Janyce Huynh	Technician
Thomas M. Bartanen, M.S.	Organic Lab Manager
Cynthia Phipps, B.S.	Environmental Chemist
Hao Van Le, B.S.	Environmental Chemist
Mark D. Brock	Field Services
Patrick Wheeler	Field Services
Joanna Culham	Office Manager
Yolanda Starr	Customer Services
Narine Sylvia	Customer Services
San Joaquin	
Neil Jessup, B.S.	Agronomist/Field Service

Laboratory Organization and Responsibilities

Key Personnel Qualification Summary - Santa Paula

Darrell H. Nelson

Current Responsibilities:
President and Lab Director:
- To oversee all operational aspects of the Santa Paula and Stockton laboratories
- To guide and direct managers towards the corporation's goals
- To report to the Board of Directors and the stockholders

Work Experience:
Assistant Manager, FGL
- Chemical analysis of drinking and waste waters, soils and plant materials
- Supervision of a number of lab operations including work scheduling and field services
- Customer Interface

Formal Education:
- B.S. (1970) in Soil and Water Science, University of California, Davis.

Continuing Education:
- University of Southern California (USC) School of Business Administration, "Customer Service Management," April 1990.
- Hazardous Waste Operations and Emergency Response Training, OSHA 29 CFR 1910.120, 40 hr plus annual refresher.
- American Chemical Society (ACS), "Quality Assurance for Analytical Chemistry," Nov. 1991.
- University of California Davis (UCD), "Marketing Professional Services," Feb. 1988.
- University of California Davis (UCD), "Guerrilla Marketing," Feb. 1988.
- University of California Davis (UCD), "Enhancing Sales Skills," Feb. 1988.
- American Water Works Association, "Approved Water Sampling Procedures," March 1991.
- California Agricultural Leadership Program, 1976 - 1978.
- NPDES Requirements for Industrial and Construction Site Storm Water Discharges, ASCE, Feb. 1992.
- Senate bill #198, compliance training (State Fund Insurance)
- Nevada Nuclear Associates, "Fundamentals of Radiochemistry", February 1994.

Memberships:
Professional:
- American Chemical Society
- American Water Works Association
- Association of California Testing Laboratories

Laboratory Organization and Responsibilities

Key Personnel Qualification Summary - Santa Paula

Kurt Wilkinson

Current Responsibilities:

Vice-President:
- To support the president in all operational, technical and strategic aspects relating to the corporation

Quality Assurance Director:
- Primarily responsible for FGL's Quality Assurance Program

Inorganic Lab Manager:
- Work scheduling and planning for Inorganic Lab
- Staff training and general management
- Client consultation on analysis needs
- Data interpretation

Work Experience:
- 8 years experience in environmental testing of drinking water, wastewater, hazardous waste and air analysis
- Additional experience in agricultural testing of soils, plant tissue and food products

Formal Education:
- B.S. (1987) in Biochemistry, California Polytechnic State University, San Luis Obispo

Continuing Education:
- American Chemical Society (ACS), "Environmental Analytical Chemistry, Water and Waste," Nov. 1991.
- American Chemical Society (ACS), "Gas Chromatography/Mass Spectrometry," April 1992.
- Halliburton NUS, "Solving the Mysteries, Collecting Environmental Samples," April 1992.

Memberships:

Professional:
- American Chemical Society (ACS)

Laboratory Organization and Responsibilities

Key Personnel Qualification Summary - Santa Paula

Denis Barry

Current Responsibilities:
Marketing Director:
- Responsible for marketing of FGL's services to city, county and state agencies in addition to private companies
- Compilation and implementation of FGL's marketing plans
- Responsible for FGL's informational and promotional materials

Work Experience:
- 3 years experience in marketing analytical services
- Marketing consultancy experience focused on small to medium sized companies
- International programs targeted mainly at the European Economic Community for small U.S. companies

Formal Education:
- B.Comm (Bachelor of Commerce), University College, Dublin, Ireland

Continuing Education:
- Computer Appreciation - Moorpark College, 1989

Memberships:
- Vice President - Irish American Club of Ventura County

Laboratory Organization and Responsibilities

Key Personnel Qualification Summary - Santa Paula

Dudley S. Jayasinghe

Current Responsibilities:
Technical Director -
- Develop new methods and monitor and improve existing methods
- Provide guidance and technical expertise to analysts, review of data and client reports
- Consult with clients on specific needs

Work Experience:
- 6 years on gas chromatograph/mass spectrometer
- 1 year GC/MS
- 3 years as research officer
- 2 years teaching at undergraduate level

Formal Education:
- B.S. (1980) in Organic Chemistry with minor in Physics, University of Peradeniya, Sri Lanka.
- Ph.D. (1989) in Analytical Chemistry with minor in Physical and Organic Chemistry, Oregon State University.

Continuing Education:
- Post-Doctoral Research in soil chemistry August 1989 - Sept. 1990, Oregon State University.

Memberships:
Professional:
- American Chemical Society
- Phi Lamda Upsilon Academic Honorarium

Laboratory Organization and Responsibilities

Key Personnel Qualification Summary - Santa Paula

Roger Perry

Current Responsibilities:
Health and Safety Officer:
- **Responsible for design and implementation of FGL's Health and Safety programs**
- **Organic Department Chemist**

Experience:
- **11 years experience as an environmental analytical chemist**
- **Health and Safety regulations and compliance**
- **Handling accumulation and disposal of Hazardous Wastes and Radioactive Materials**

Formal Education:
- **B.A. (1982) in Chemistry, Sonoma State University, Sonoma, California**

Continuing Education:
- **Hazardous Waste Operations and Emergency Response Training, OSHA 29 CFR 1910.120, 40 hr plus annual refresher.**

Laboratory Organization and Responsibilities

Key Personnel Qualification Summary - Santa Paula

Eric Cotting

Current Responsibilities:
- Development and maintenance of FGL's Laboratory Information Management System (LIMS)
- Training of personnel in the effective use of LIMS

Work Experience:
- Developed customized LIMS system for FGL
- As research assistant with the University of Wisconsin, was involved in the modification of an existing theoretical computational program designed to model quantum mechanical properties of the Helium Atom

Formal Education:
- B.S. (1981) Chemistry, University of Alaska, Fairbanks, Alaska
- B.S. (1981) Math, University of Alaska, Fairbanks, Alaska
- B.S. (1981) Physics, University of Alaska, Fairbanks, Alaska
- M.S. (1987) Physical Chemistry, University of Wisconsin, Madison, Wisconsin

Continuing Education:
- Computer Networking Seminar: Santa Barbara, CA. January 1991
- Nevada Nuclear Associates,"Fundamentals of Radiochemistry", February 1994.

Laboratory Organization and Responsibilities

Key Personnel Qualification Summary - Santa Paula

Kelly Dunnahoo

Current Responsibilities:
Organic Lab Manager:
- **Organization of work flow in Organic Laboratory**
- **Personnel training, methods development, instrument troubleshooting**
- **Response to specific customer enquiries**

Work Experience:
- **8 years experience in environmental and geochemical analysis**
- **4 years of supervisory and management roles in organic laboratory operations**

Formal Education:
- **B.S. (1987) in Biochemistry, University of California, Los Angeles**

Continuing Education:
- **AOAC, "QA for Analytical Labs", November 1991.**

Laboratory Organization and Responsibilities

Key Personnel Qualification Summary - Santa Paula

Michel M. Franco

Current Responsibilities:
Radiochemistry Lab Manager:
- Work scheduling, staff supervision for Radiochemistry Laboratory
- Personnel training, methods development, instrument troubleshooting
- Client interface and project management

Work Experience:
- 6 years experiencein radiochemical analysis, inorganic analysis and organic analysis for TOX and TOC.
- Developed instrument analysis experiment for CSUN (1988)
- Sample trouble shooting, processing and department liason at Reference Laboratory (1986)

Formal Education:
- B.A. (1990) Chemistry, California State University, Northridge

Continuing Education:
- Nevada Nuclear Associates, "Fundamentals of Radiochemistry", February 1994.
- Canberraa Industries Inc., "Environmental Radioactivity Quantification Workshop", March 1994.

Laboratory Organization and Responsibilities

Key Personnel Qualification Summary - Santa Paula

Ricardo Sandoval

Current Responsibilities:
Agriculture Lab Manager:
- **Management of Agricultural Department**
- **Supervision and training of staff**

Work Experience:
- **10 years experience in agricultural testing of soils and plant tissue**
- **Ranch and Nursery experience dealing with irrigation, pollution, and transplantation**

Formal Education:
- **B.S. (1985) in Crop Science and Technical Degree in Fruit Science, California Polytechnic State University, San Luis Obispo.**

Laboratory Organization and Responsibilities

Key Personnel Qualification Summary - Stockton

Thomas Bartanen

Current Responsibilities:

Lab Director:
- Management of the Stockton Laboratory
- Liason with Santa Paula (Corporate) on Stockton lab's performance, budgets and financial results

Quality Assurance Officer:
- Oversees Stockton laboratory's Quality Assurance Program
- Responsible for organic analysis on drinking water, wastewater, and hazardous waste samples

Organic Lab Manager:
- Organization of work flow in Organic Laboratory
- Personnel training, methods development, instrument troubleshooting
- Response to specific customer enquiries

Work Experience:
- Experience includes work in soil microbiology, toxicity and reservoir limnology
- Direct customer consultation on needs, concerns and complaints

Formal Education:
- B.S. (1980) in Environmental Science, Bradley University, Peoria, IL
- M.S. (1987) in Aquatic Ecology, University of Nevada, Las Vegas

Continuing Education:
- American Association of Technologists GC/MS Workshop-data interpretation
- CDFA - Pesticide Residue Workshop

Memberships:

Civic:
- SCA Inc. (Historical Society)
- Finnish American Home Association (FAHA)

Laboratory Organization and Responsibilities

Key Personnel Qualification Summary - Stockton

Mark Ketcherside

Current Responsibilities:
Inorganic Lab Manager:
- Work scheduling and planning for Inorganic Lab
- Staff training and general management
- Client consultation on analysis needs
- Data interpretation

Work Experience:
- 3 years experience in environmental testing of drinking water, wastewater and hazardous waste
- 6 years experience in microbiological and chemical testing for food, water and medical industries

Formal Education:
- B.S. (1987) in Biological Sciences, California Polytechnic State University, San Luis Obispo

Continuing Education:
Delta College:
- Management and Human Relations
- Business Law

California Chamber of Commerce:
- Hazardous Waste Certification

Laboratory Organization and Responsibilities

Key Personnel Qualification Summary - San Joaquin

Neil Jessup

Current Responsibilities:
Agronomist/Field service - Visalia
- Technical Representative - San Joaquin Valley
- Coordinating sampling and sample pick up in the South San Joaquin Valley
- Consultation with clients on sampling and analysis requirements
- Proposal preparation for contracts on environmental and agricultural testing

Work Experience:
- Ten years experience in areas of field service and sampling
- Considerable background in city, county, state and federal regulations for environmental testing requirements

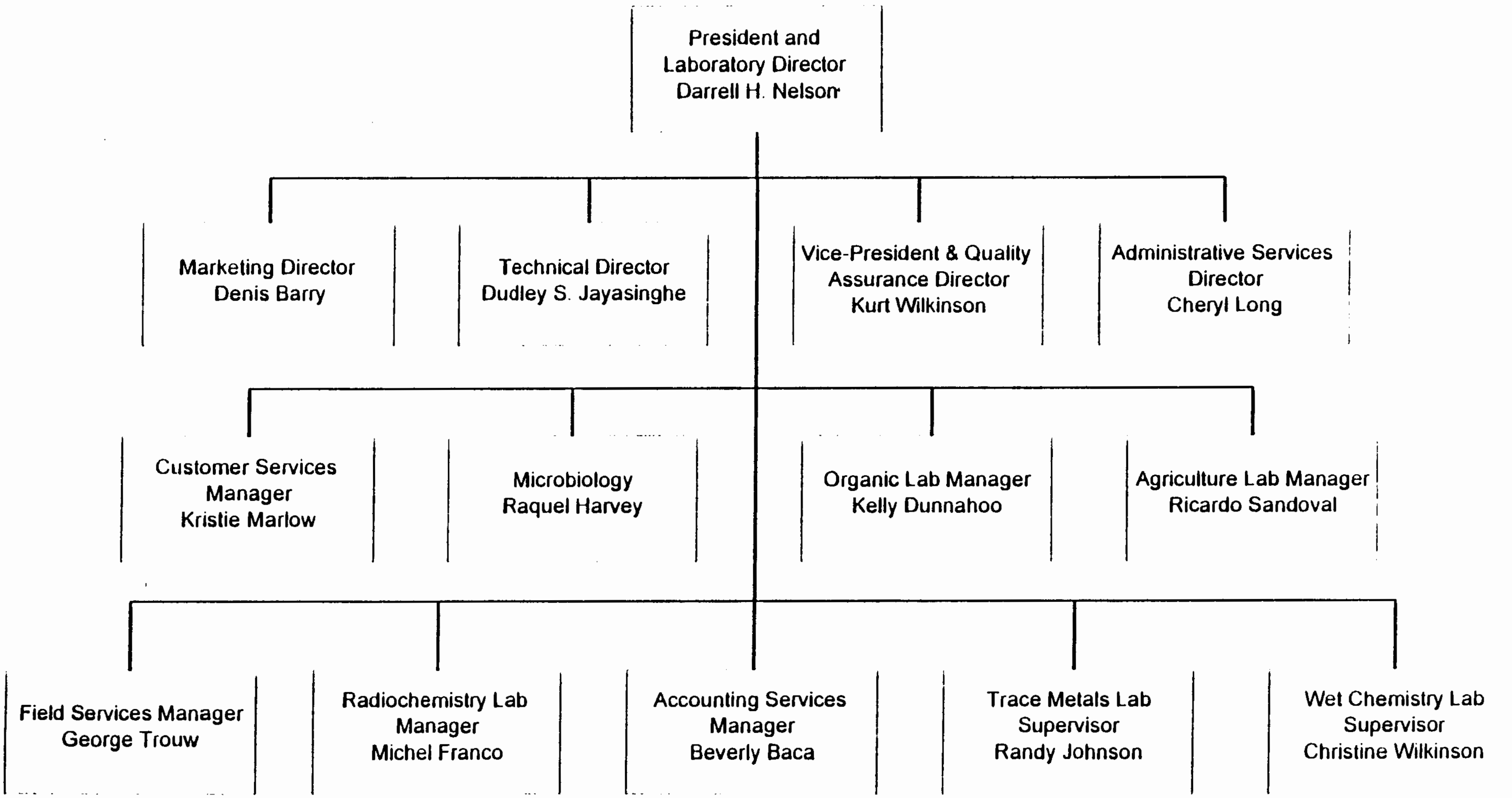
Formal Education:
- B.S. (1977) in Agronomy, California Polytechnic State University, San Luis Obispo

Continuing Education:
- OSHA 40 hour trained for hazardous waste and emergency response, confined space entry and SCBA
- American Water Works Association, "Approved Water Sampling Procedures," March 1991.
- Halliburton NUS, "Solving the Mysteries, Collecting Environmental Samples," April 1992.

Memberships:
Professional:
- California Agriculture Production Consultants Association (CAPCA)
Civic:
- Tulare County Hazardous Waste Advisory Committee

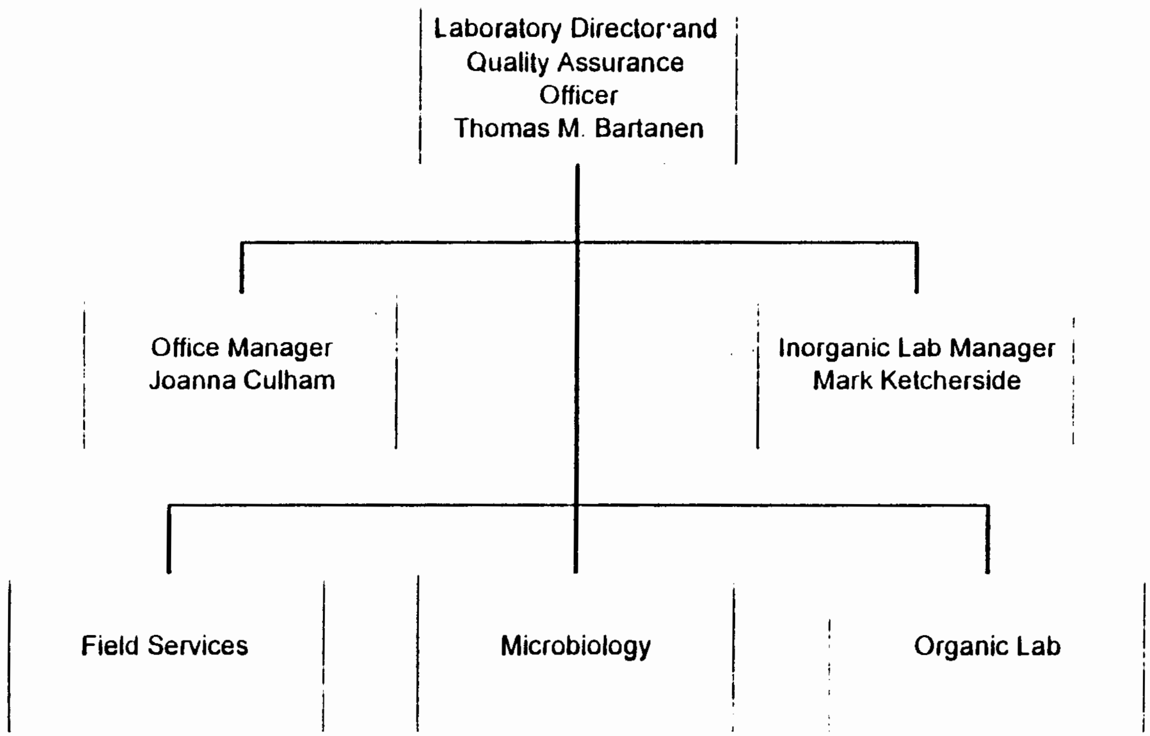
Laboratory Organization and responsibilities

Figure 4-1 Organization Chart Santa Paula Laboratory



Laboratory Organization and responsibilities

Figure 4-2 Organization Chart Stockton Laboratory



Quality Assurance Objectives

The quality assurance objectives for accuracy, precision, and Detection Limits for Reporting (DLR) are listed in Tables 5-1 (Drinking Water Methods), 5-2 (Wastewater / Hazardous Waste Liquid Methods) and 5-3 (Solid Waste / Hazardous Waste Solids Methods).

Accuracy - is based on the recovery measurement of a target analyte after known addition to a given sample or representative sample matrix (see section 14.2). Accuracy values are expressed as the percent recovery of the known value, and serve as a reflection of the total measurement error (random and systematic). The acceptance ranges for recovery (%REC-AR) are used for data validation.

Precision - is based on the difference measurement of duplicate data points (see section 14.1). Precision values are expressed as relative percent difference (RPD) and serve as a reflection of the variability in measurement replication. Surrogates are not run in duplicate, therefore RPDs are not applicable. The Maximum Acceptance Value for the RPD's (RPD-MAV) are used for data validation.

Detection Limit for Reporting (DLR) - is the routine detection limit FGL uses for reporting purposes. Detection limit studies are performed continually (see section 11.1.2.2) to ensure that the objectives listed in this section are met or exceeded. Surrogates are required for quality assurance purposes only. Therefore, DLR information is not necessary.

Completeness - FGL is currently introducing controls to document incomplete reports. These are reports that are known to lack information at the time of delivery or reports where we are notified by the client that information is not complete. Future QA manuals will have the results for data completeness documented.

TABLE 5-1 Quality Assurance Objectives for Drinking Water Methods

CONSTITUENT	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR ug/L
EPA Method 501.2			
Bromodichloromethane	70-130	20	0.5
Bromoform	70-130	20	0.5
Chloroform	70-130	20	0.5
Dibromochloromethane	70-130	20	0.5
EPA Method 502.2			
Surrogates			
BFB	70-130	N/A	N/A
Fluorobenzene	70-130	N/A	N/A
Chlorofluorobenzene	70-130	N/A	N/A
Analytes			
Benzene	37-151	30	0.5
Bromobenzene	50-150	30	0.5
Bromochloromethane	50-150	30	0.5
Bromodichloromethane	35-155	30	0.5
Bromoform	45-169	30	0.5
Bromomethane	D-242	30	0.5
n-Butylbenzene	50-150	30	0.5
sec-Butylbenzene	50-150	30	0.5
tert-Butylbenzene	50-150	30	0.5

Quality Assurance Objectives

TABLE 5-1 Quality Assurance Objectives for Drinking Water Methods

CONSTITUENT	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR ug/L
Method EPA 502.2 continued			
Carbon tetrachloride	70-140	30	0.5
Chlorobenzene	37-160	30	0.5
Chloroethane	14-320	30	0.5
Chloroform	51-128	30	0.5
Chloromethane	D-273	30	0.5
2-Chlorotoluene	50-150	30	0.5
4-Chlorotoluene	50-150	30	0.5
DBCP	50-150	30	0.5
Dibromochloromethane	53-149	30	0.5
1,2-Dibromoethane	50-150	30	0.5
Dibromomethane	50-150	30	0.5
1,2-Dichlorobenzene	50-150	30	0.5
1,3-Dichlorobenzene	50-150	30	0.5
1,4-Dichlorobenzene	50-150	30	0.5
Dichlorodifluoromethane	50-150	30	0.5
1,1-Dichloroethane	59-155	30	0.5
1,2-Dichloroethane	49-155	30	0.5
1,1-Dichloroethylene	D-234	30	0.5
cis-1,2-Dichloroethylene	50-150	30	0.5
trans-1,2-Dichloroethylene	54-156	30	0.5
1,2-Dichloropropane	D-210	30	0.5
1,3-Dichloropropane	50-150	30	0.5
2,2-Dichloropropane	50-150	30	0.5
1,1-Dichloropropene	50-150	30	0.5
cis-1,3-Dichloropropene	D-227	30	0.5
trans-1,3-Dichloropropene	17-183	30	0.5
Ethylbenzene	37-162	30	0.5
Hexachlorobutadiene	50-150	30	0.5
Isopropylbenzene	50-150	30	0.5
p-Isopropyltoluene	50-150	30	0.5
Methylene Chloride	D-221	30	0.5
Naphthalene	50-150	30	0.5
n-Propylbenzene	50-150	30	0.5
Styrene	50-150	30	0.5
1,1,1,2-Tetrachloroethane	50-150	30	0.5
1,1,2,2-Tetrachloroethane	46-157	30	0.5
Tetrachloroethylene	64-148	30	0.5
Toluene	47-163	30	0.5
1,2,3-Trichlorobenzene	50-150	30	0.5
1,2,4-Trichlorobenzene	50-150	30	0.5
1,1,1-Trichloroethane	52-150	30	0.5
1,1,2-Trichloroethane	71-157	30	0.5
Trichloroethylene	71-157	30	0.5
Trichlorofluoromethane	17-181	30	0.5
1,2,3-Trichloropropane	50-150	30	0.5
1,1,2-Trichlorotrifluoroeth	50-150	30	0.5

Quality Assurance Objectives

TABLE 5-1 Quality Assurance Objectives for Drinking Water Methods

CONSTITUENT	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR ug/L
Method EPA 502.2 continued			
1,2,4-Trimethylbenzene	52-150	30	0.5
1,3,5-Trimethylbenzene	50-150	30	0.5
Vinyl Chloride	D-251	30	0.5
Xylenes m,p	50-150	30	0.5
Xylenes o	50-150	30	0.5
Method EPA 504			
DBCP	70-130	30	0.02
EDB	70-130	30	0.01
Method EPA 505			
Alachlor	50-150	30	0.2
Aldrin	42-122	30	0.01
Chlordane	45-119	30	0.1
Dieldrin	36-146	30	0.01
Endrin	30-147	30	0.01
Heptachlor	34-111	30	0.01
Heptachlor Epoxide	37-142	30	0.01
Hexachlorobenzene	50-150	30	0.01
Lindane	32-127	30	0.05
Methoxychlor	50-150	30	0.1
Toxaphene	41-126	30	0.5
PCB 1016	50-114	30	0.3
PCB 1221	15-178	30	0.3
PCB 1232	10-215	30	0.3
PCB 1242	39-150	30	0.3
PCB 1248	38-158	30	0.3
PCB 1254	29-131	30	0.3
PCB 1260	8-127	30	0.3
Method EPA 507			
Surrogates			
1,3-Dimethyl-2-nitrobenzene	53-105	N/A	N/A
9-Nitroanthracene	50-134	N/A	N/A
Analytes			
Alachlor	70-130	30	1
Atrazine	70-130	30	1
Bromocil	70-130	30	5
Butachlor	70-130	30	1
Diazinon	70-130	30	2
Dimethoate	70-130	30	2
Metolachlor	70-130	30	1
Metribuzin	70-130	30	0.1
Molinate	70-130	30	2
Prometryne	70-130	30	2
Propachlor	70-130	30	1

Quality Assurance Objectives

TABLE 5-1 Quality Assurance Objectives for Drinking Water Methods

CONSTITUENT	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR ug/L
Method EPA 507 continued			
Simazine	70-130	30	1
Thiobencarb	70-130	30	1
Method EPA 508			
Surrogate			
Hexachlorobenzene	70-130	N/A	N/A
Analytes			
Chlorothalonil	70-130	30	0.2
PCB 1016	50-114	30	0.08
PCB 1221	15-178	30	0.2
PCB 1232	10-215	30	0.2
PCB 1242	39-150	30	0.2
PCB 1248	38-158	30	0.1
PCB 1254	29-131	30	0.1
PCB 1260	8-127	30	0.2
Method EPA 508A			
PCB's as Decachlorobiphenyl	70-130	30	0.2
Method EPA 510			
Bromodichloromethane	70-130	30	0.5
Bromoform	70-130	30	0.5
Chloroform	70-130	30	0.5
Dibromochloromethane	70-130	30	0.5
Method EPA 515.1			
Surrogate			
2,4-DCAA	30-150	N/A	N/A
Analytes			
Bentazon	30-150	30	2
Chloramben	30-150	30	1
2,4-D	30-150	30	2
2,4-DB	30-150	30	2
Dalapon	30-150	30	2
Dicamba	30-150	30	5
Dichloroprop	30-150	30	2
Dinoseb	30-150	30	1
Pentachlorophenol	30-150	30	0.2
Picloram	30-150	30	1
2,4,5-T	30-150	30	1
2,4,5-TP (Silvex)	30-150	30	1

Quality Assurance Objectives

TABLE 5-1 Quality Assurance Objectives for Drinking Water Methods

CONSTITUENT	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR ug/L
Method EPA 524.2			
Surrogates			
1,2-Dichloroethane-d4	76-114	N/A	N/A
Toluene-d8	88-110	N/A	N/A
BFB	86-115	N/A	N/A
Analytes			
Acetone	50-150	30	0.5
Benzene	37-151	30	0.5
Bromobenzene	50-150	30	0.5
Bromochloromethane	50-150	30	0.5
Bromodichloromethane	35-155	30	0.5
Bromoform	45-169	30	0.5
Bromomethane	D-242	30	0.5
2-Butanone (MEK)	50-150	30	0.5
n-Butylbenzene	50-150	30	0.5
sec-Butylbenzene	50-150	30	0.5
tert-Butylbenzene	50-150	30	0.5
Carbon disulfide	50-150	30	0.5
Carbon tetrachloride	70-140	30	0.5
Chlorobenzene	37-160	30	0.5
Chloroethane	14-230	30	0.5
Chloroform	51-138	30	0.5
Chloromethane	D-273	30	0.5
2-Chlorotoluene	50-150	30	0.5
4-Chlorotoluene	50-150	30	0.5
Dibromochloromethane	53-149	30	0.5
1,2-Dibromoethane (EDB)	50-150	30	0.5
Dibromomethane	50-150	30	0.5
1,2-Dibromo-3-chloropropane	50-150	30	0.5
1,2-Dichlorobenzene	50-150	30	0.5
1,3-Dichlorobenzene	50-150	30	0.5
1,4-Dichlorobenzene	50-150	30	0.5
Dichlorodifluoromethane	50-150	30	0.5
1,1-Dichloroethane	59-155	30	0.5
1,2-Dichloroethane	49-155	30	0.5
1,1-Dichloroethylene	D-234	30	0.5
cis-1,2-Dichloroethylene	50-150	30	0.5
trans-1,2-Dichloroethylene	54-156	30	0.5
1,2-Dichloropropane	D-210	30	0.5
1,3-Dichloropropane	50-150	30	0.5
2,2-Dichloropropane	50-150	30	0.5
1,1-Dichloropropene	50-150	30	0.5
cis-1,3-Dichloropropene	D-227	30	0.5
trans-1,3-Dichloropropene	17-183	30	0.5
Ethylbenzene	37-162	30	0.5
Hexachlorobutadiene	50-150	30	0.5
2-Hexanone	50-150	30	0.5

Quality Assurance Objectives

TABLE 5-1 Quality Assurance Objectives for Drinking Water Methods

CONSTITUENT	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR ug/L
Method EPA 524.2 continued			
Isopropylbenzene	50-150	30	0.5
p-Isopropyltoluene	50-150	30	0.5
Methylene chloride	D-221	30	0.5
4-Methyl-2-pentanone (MIBK)	50-150	30	0.5
Naphthalene	50-150	30	0.5
n-Propylbenzene	50-150	30	0.5
Styrene	50-150	30	0.5
1,1,1,2-Tetrachloroethane	50-150	30	0.5
1,1,2,2-Tetrachloroethane	46-157	30	0.5
Tetrachloroethylene	64-148	30	0.5
Toluene	47-163	30	0.5
1,2,3-Trichlorobenzene	50-150	30	0.5
1,2,4-Trichlorobenzene	50-150	30	0.5
1,1,1-Trichloroethane	52-162	30	0.5
1,1,2-Trichloroethane	52-150	30	0.5
Trichloroethylene	71-157	30	0.5
Trichlorofluoromethane	17-181	30	0.5
1,2,3-Trichloropropane	50-150	30	0.5
1,1,2-Trichlorotrifluoroeth	50-150	30	0.5
1,2,4-Trimethylbenzene	50-150	30	0.5
Vinyl acetate	50-150	30	0.5
Vinyl chloride	D-251	30	0.5
Xylenes m,p	50-150	30	0.5
Xylenes o	50-150	30	0.5
Method EPA 525			
Surrogate			
Perylene-d12	50-150	N/A	N/A
Analytes			
Acenaphthylene	50-150	30	1
Anthracene	50-150	30	1
Benzo(a)anthracene	50-150	30	1
Benzo(b)fluoranthene	50-150	30	1
Benzo(k)fluoranthene	50-150	30	1
Benzo(g,h,i)perylene	50-150	30	1
Benzo(a)pyrene	50-150	30	0.1
Butylbenzylphthalate	50-150	30	1
Chrysene	50-150	30	1
Dibenzo(a,h)anthracene	50-150	30	1
Dimethylphthalate	50-150	30	1
Diethylphthalate	50-150	30	1
Di-n-butylphthalate	50-150	30	1
bis(2-Ethylhexyl)adipate	50-150	30	1
bis(2-Ethylhexyl)phthalate	29-137	30	3
Fluorene	50-150	30	1
Hexachlorobenzene	50-150	30	1

Quality Assurance Objectives

TABLE 5-1 Quality Assurance Objectives for Drinking Water Methods

CONSTITUENT	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR ug/L
Method EPA 525 continued			
Hexachlorocyclopentadiene	50-150	30	1
Indeno(1,2,3-c,d)pyrene	50-150	30	1
Pentachlorophenol	50-150	30	4
Phenanthrene	50-150	30	1
Pyrene	50-150	30	1
Method EPA 531.1			
Surrogate			
BDMC	70-130	N/A	N/A
Analytes			
Aldicarb	70-130	30	3
Aldicarb Sulfone	70-130	30	3
Aldicarb Sulfoxide	70-130	30	3
Carbofuran	70-130	30	5
Carbaryl	70-130	30	5
3-Hydroxycarbofuran	70-130	30	10
Methiocarb	70-130	30	10
Methomyl	70-130	30	5
1-Napthol	70-130	30	5
Oxymal	70-130	30	5
Propoxur	70-130	30	5
Method EPA 547			
Glyphosate	70-130	20	20
Method EPA 548			
Endothall	70-130	20	40
Method EPA 549			
Diquat	70-130	20	2
Paraquat	70-130	20	1
Method EPA 550.1			
Acenaphthene	70-130	20	3
Acenaphthylene	70-130	20	2
Anthracene	70-130	20	0.1
Benzo(a)anthracene	70-130	20	0.1
Benzo(a)pyrene	70-130	20	0.1
Benzo(b)fluoranthene	70-130	20	0.2
Benzo(g,h,i)perylene	70-130	20	0.1
Benzo(k)fluoranthene	70-130	20	0.1
Chrysene	70-130	20	0.1
Dibenzo(a,h)anthracene	70-130	20	0.3
Fluoranthene	70-130	20	2
Fluorene	70-130	20	2
Indeno(1,2,3-c,d)pyrene	70-130	20	0.1

Quality Assurance Objectives

TABLE 5-1 Quality Assurance Objectives for Drinking Water Methods

CONSTITUENT	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR ug/L
Method EPA 550.1 continued			
1-Methylnaphthalene	70-130	20	2
2-Methylnaphthalene	70-130	20	2
Naphthalene	70-130	20	2
Phenanthrene	70-130	20	2
Pyrene	70-130	20	0.1
Method EPA 552			
Bromochloroacetic acid	70-130	20	1
Dibromoacetic acid	70-130	20	1
Dichloroacetic acid	70-130	20	1
2,4-Dichlorophenol	70-130	20	1
Monobromoacetic acid	70-130	20	1
Monochloroacetic acid	70-130	20	1
Trichloroacetic acid	70-130	20	1
2,4,6-Trichlorophenol	70-130	20	1

CONSTITUENT	Method	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR mg/L
Inorganic Chemicals				
Acidity	305.1	N/A	20	1
Alkalinity (as CaCO3)	310.0	N/A	20	1
Bicarbonate	310.1	N/A	20	1
BOD	405.1	80-120	20	2
Bromide	300.0	80-120	20	0.5
Carbon Dioxide	SM4500C	N/A	20	1
Carbonate	310.1	N/A	20	1
COD	410.4	75-125	20	4
Chloride	300.0	80-120	20	1
Chlorine Residual	330.2	N/A	20	0.1
Chlorine Residual	330.5	N/A	20	0.1
Color	110.3	N/A	20	3 units
Electrical Conductivity	120.1	80-120	20	1 umhos
Cyanide, Total	335.2	75-125	20	0.01
Fluoride by electrode	340.2	80-120	20	0.1
Hydroxide	310.0	N/A	20	1
MBAS	425.1	70-130	20	0.05
Nitrogen				
Ammonia	350.1	80-120	20	1
Nitrate	300.0	80-120	20	0.1
Nitrite	300.0	80-120	20	0.1
Nitrate	353.2	80-120	20	0.1
Nitrite	353.2	80-120	20	0.1
Total Kjeldahl	351.2	80-120	20	1
Odor	140.1	N/A	20	1 TON

Quality Assurance Objectives

TABLE 5-1 Quality Assurance Objectives for Drinking Water Methods

CONSTITUENT	Method	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR mg/L
Inorganic Chemical EPA Methods continued				
Oil and Grease	413.1	N/A	20	3
Oxygen, dissolved	360.1	N/A	20	0.5
pH	150.1	N/A	20	N/A
Phenols	420.1	75-125	20	0.1
Phosphorous				
Phosphate	300.0	80-120	20	0.1
Total	365.2	75-125	20	0.1
Solids/Residue				
Filterable (TDS)	160.1	NA	20	40
Non-filterable (TSS)	160.2	NA	20	10
Total	160.3	NA	20	40
Volatile	160.4	NA	20	40
Settleable	160.5	NA	20	0.1 ml/L
Sulfate	300.0	80-120	20	1
Sulfide				
Total	376.2	N/A	20	0.1
Dissolved	376.2	N/A	20	0.1
Sulfite	377.1	N/A	20	0.1
Tannin & Lignin	SM5500B	N/A	20	1
Titration - pH adjust.	N/A	N/A	20	1
Turbidity	180.1	N/A	20	0.2 NTU

CONSTITUENT	Method	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR mg/L
Trace Metals				
Aluminum	200.9	75-125	20	20
Aluminum	200.8	75-125	20	5
Antimony	200.9	75-125	20	5
Antimony	200.8	75-125	20	0.5
Arsenic	200.9	75-125	20	2
Arsenic	200.8	75-125	20	2
Barium	200.7	80-120	20	20
Barium	200.8	75-125	20	0.5
Beryllium	200.9	75-125	20	1
Beryllium	200.8	75-125	20	0.5
Boron	200.7	80-120	20	0.1 mg/L
Boron	200.8	75-125	20	0.01 mg/L
Cadmium	200.9	75-125	20	1
Cadmium	200.8	75-125	20	0.5
Calcium	200.7	80-120	20	1 mg/L
Chromium	200.9	75-125	20	5
Chromium	200.8	75-125	20	2
Chromium VI	7196	D-120	20	10
Cobalt	200.7	80-120	20	50
Cobalt	200.8	75-125	20	0.5

Quality Assurance Objectives

TABLE 5-1 Quality Assurance Objectives for Drinking Water Methods

CONSTITUENT	Method	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR ug/L
Trace Metals continued				
Copper	200.7	80-120	20	50
Copper	200.8	75-125	20	2
Iron	200.7	80-120	20	50
Lead	200.9	75-125	20	5
Lead	200.8	75-125	20	0.5
Lithium	SM3500L	80-120	20	10
Magnesium	200.7	80-120	20	1 mg/L
Manganese	200.7	80-120	20	30
Manganese	200.8	75-125	20	1
Mercury	245.1	75-125	20	0.2
Mercury	245.2	75-125	20	0.2
Molybdenum	200.7	80-120	20	50
Molybdenum	200.8	75-125	20	0.5
Nickel	200.7	80-120	20	50
Nickel	200.8	75-125	20	1
Potassium	200.7	80-120	20	1 mg/L
Selenium	200.9	75-125	20	2
Selenium	200.8	75-125	20	2
Silica	200.7	80-120	20	1 mg/L
Silver	200.9	75-125	20	0.5
Silver	200.8	75-125	20	0.5
Sodium	200.7	80-120	20	1 mg/L
Strontium	200.7	80-120	20	50
Thallium	200.9	75-125	20	2
Thallium	200.8	75-125	20	0.5
Tin	200.9	75-125	20	50
Uranium	200.7	80-120	20	100
Vanadium	200.7	80-120	20	20
Zinc	200.7	80-120	20	50
Zinc	200.8	75-125	20	5

CONSTITUENT	Method	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR pCi/L
Radiochemistry				
Gamma Emitters	901.1	80-120	20	1
Gross Alpha	900.0	60-140	30	1
Gross Beta	900.0	60-140	30	1
Radon	913.0	N/A	20	10
Strontium 90	905.0	60-140	30	1
Total Radium	900.1	75-125	20	1
Radium 226	903.1	75-125	20	1
Radium 228	904.0	75-125	20	1
Tritium	906.0	75-125	20	300
Uranium	908.0	75-125	20	1

Quality Assurance Objectives

TABLE 5-2 Quality Assurance Objectives for Wastewater / Hazardous Waste Liquid Methods

CONSTITUENT	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR ug/L
Method EPA 601/8010			
Surrogates			
BFB	50-150	N/A	N/A
Fluorobenzene	50-150	N/A	N/A
Chlorofluorobenzene	50-150	N/A	N/A
Analytes			
Bromodichloromethane	42-172	20	0.5
Bromoform	13-159	20	0.5
Bromomethane	D-144	20	0.5
Carbon tetrachloride	43-143	20	0.5
Chlorobenzene	38-150	20	0.5
Chloroethane	46-137	20	0.5
Chloroform	49-133	20	0.5
Chloromethane	D-193	20	0.5
Dibromochloromethane	24-191	20	0.5
1,2-Dichlorobenzene	D-208	20	0.5
1,3-Dichlorobenzene	7-187	20	0.5
1,4-Dichlorobenzene	42-143	20	0.5
Dichlorodifluoromethane	50-150	20	0.5
1,1-Dichloroethane	47-132	20	0.5
1,2-Dichloroethane	51-147	20	0.5
1,1-Dichloroethylene	28-167	20	0.5
trans-1,2-Dichloroethylene	38-155	20	0.5
1,2-Dichloropropane	44-156	20	0.5
cis-1,3-Dichloropropene	22-178	20	0.5
trans-1,3-Dichloropropene	22-178	20	0.5
Methylene chloride	25-162	20	0.5
1,1,2,2-Tetrachloroethane	50-150	20	0.5
Tetrachloroethylene	26-162	20	0.5
1,1,1-Trichloroethane	41-138	20	0.5
1,1,2-Trichloroethane	39-139	20	0.5
Trichloroethylene	81-119	20	0.5
Trichlorofluoromethane	21-156	20	0.5
Vinyl chloride	28-163	20	0.5
Method EPA 8015M TPH (purgeable)			
Gas	50-150	40.0	500
Method EPA 8015M TPH (extractable)			
Crude oil	50-150	40.0	500
Diesel fuel	50-150	40.0	500
Hydraulic oil	50-150	40.0	500
Jet fuel	50-150	40.0	500
Stoddard solvent	50-150	40.0	500
Waste oil	50-150	40.0	2000

Quality Assurance Objectives

TABLE 5-2 Quality Assurance Objectives for Wastewater / Hazardous Waste Liquid Methods

CONSTITUENT	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR ug/L
Method EPA 602/8020			
Surrogates			
BFB	50-150	N/A	N/A
Analytes			
Benzene	78-133	20	0.3
Chlorobenzene	73-132	20	0.3
1,2-Dichlorobenzene	64-143	20	0.3
1,3-Dichlorobenzene	61-150	20	0.3
1,4-Dichlorobenzene	61-151	20	0.3
Ethylbenzene	75-129	20	0.3
Toluene	61-164	20	0.3
Xylene, o	69-137	20	0.3
Xylene, p	71-135	20	0.3
Xylene, m	68-133	20	0.3
Method EPA 604/8040 (analyzed by method 625/8270)			
2-Chlorophenol	23-134	30	10
2,4-Dichlorophenol	39-135	30	10
2,4-Dimethylphenol	42-109	30	10
4,6-Dinitro-o-cresol	D-181	30	50
2,4-Dinitrophenol	D-191	30	50
2-Methylphenol	50-150	30	10
4-Methylphenol	50-150	30	10
2-Nitrophenol	29-182	30	10
4-Nitrophenol	29-182	30	50
p-Chloro-m-cresol	22-147	30	20
Pentachlorophenol	14-176	30	50
Phenol	5-112	30	10
2,4,5-Trichlorophenol	37-144	30	10
2,4,6-Trichlorophenol	37-144	30	10
Method EPA 608/8080			
Surrogates			
Hexachlorobenzene	26-116	N/A	N/A
Dibutylchlorendate	44-125	N/A	N/A
Analytes			
Aldrin	20-123	30	0.2
Alpha BHC	37-134	30	0.2
Beta BHC	17-147	30	0.2
Delta BHC	19-140	30	0.2
Chlordane	45-119	30	0.2
o,p - DDD	31-141	30	0.2
p,p - DDD	31-141	30	0.2
o,p - DDE	30-145	30	0.2
p,p - DDE	30-145	30	0.2
o,p - DDT	25-160	30	0.2
p,p - DDT	70-160	30	0.2

Quality Assurance Objectives

TABLE 5-2 Quality Assurance Objectives for Wastewater / Hazardous Waste Liquid Methods

CONSTITUENT	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR ug/L
Method EPA 608/8080 continued			
Dieldrin	47-126	30	0.2
Endosulfan I	45-153	30	0.2
Endosulfan II	D-202	30	0.2
Endosulfan sulfate	26-144	30	0.2
Endrin	30-147	30	0.2
Endrin aldehyde	50-150	30	0.2
Heptachlor	25-133	30	0.2
Heptachlor epoxide	37-142	30	0.2
Lindane	81-119	30	0.2
Methoxychlor	50-150	30	0.5
Toxaphene	41-126	30	5
PCB 1016	50-114	30	2
PCB 1221	15-178	30	2
PCB 1232	10-215	30	2
PCB 1242	39-150	30	2
PCB 1248	38-158	30	2
PCB 1254	29-131	30	2
PCB 1260	8-127	30	2
Method EPA 610/8310			
Acenaphthene	70-130	20	3
Acenaphthylene	70-130	20	2
Anthracene	70-130	20	0.1
Benzo(a)anthracene	70-130	20	0.1
Benzo(b)fluoranthene	70-130	20	0.2
Benzo(k)fluoranthene	70-130	20	0.1
Benzo(g,h,i)perylene	70-130	20	0.1
Benzo(a)pyrene	70-130	20	0.2
Chrysene	70-130	20	0.1
Dibenzo(a,h)anthracene	70-130	20	0.3
Fluoranthene	70-130	20	2
Fluorene	70-130	20	2
Indeno(1,2,3-c,d)pyrene	70-130	20	0.1
Naphthalene	70-130	20	2
Phenanthrene	70-130	20	2
Pyrene	70-130	20	0.1
Method EPA 614/8140			
Surrogates			
1,3-Dimethyl-2-nitrobenzene	50-150	N/A	N/A
9-Nitroanthracene	50-150	N/A	N/A
Analytes			
Azinphos methyl	50-150	30	2
Bolstar	50-150	30	2
Chlorpyrifos	50-150	30	2
Coumaphos	50-150	30	2

Quality Assurance Objectives

TABLE 5-2 Quality Assurance Objectives for Wastewater / Hazardous Waste Liquid Methods

CONSTITUENT	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR ug/L
Method EPA 614/8140 continued			
Demeton-o,s	50-150	30	2
Diazinon	50-150	30	2
Dichlorvos	50-150	30	2
Disulfoton	50-150	30	2
Ethion	50-150	30	2
Ethoprop	50-150	30	2
Fensulfoton	50-150	30	2
Fenthion	50-150	30	2
Malathion	50-150	30	2
Merphos	50-150	30	2
Mevinphos	50-150	30	2
Naled	50-150	30	2
Parathion, ethyl	50-150	30	2
Parathion, methyl	50-150	30	2
Phorate	50-150	30	2
Ronnel	50-150	30	2
Stirophos	50-150	30	2
Tokuthion	50-150	30	2
Trichlornate	50-150	30	2
Method EPA 615/8150			
Surrogate			
2,4-DCAA	30-150	N/A	N/A
Analytes			
Bentazon	30-150	30	20
Chloramben	30-150	30	10
2,4-D	30-150	30	100
Dalapon	30-150	30	10
2,4-DB	30-150	30	100
Dicamba	30-150	30	10
Dichlorprop	30-150	30	20
Dinoseb	30-150	30	10
Pentachlorophenol	30-150	30	10
Picloram	30-150	30	10
2,4,5-T	30-150	30	10
2,4,5-TP (Silvex)	30-150	30	10
Method EPA 624/8240			
Surrogates			
1,2-Dichloroethane-d4	76-114	30	N/A
Toluene-d8	88-110	30	N/A
BFB	86-115	30	N/A
Analytes			
Acetone	50-150	30	10
Acrolein	50-150	30	100
Acrylonitrile	50-150	30	100

Quality Assurance Objectives

TABLE 5-2 Quality Assurance Objectives for Wastewater / Hazardous Waste Liquid Methods

CONSTITUENT	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR ug/L
Method EPA 624/8240 continued			
Benzene	37-151	30	0.5
Bromodichloromethane	35-155	30	1
Bromoform	45-169	30	1
Bromomethane	D-242	30	1
Carbon disulfide	50-150	30	5
Carbon tetrachloride	70-140	30	0.5
Chlorobenzene	37-160	30	0.5
Chloroethane	14-230	30	1
2-Chloroethylvinyl ether	50-150	30	10
Chloroform	51-138	30	0.5
Chloromethane	D-273	30	1
Dibromochloromethane	53-149	30	1
1,2-Dichlorobenzene	50-150	30	1
1,3-Dichlorobenzene	50-150	30	1
1,4-Dichlorobenzene	50-150	30	1
Dichlorodifuoromethane	50-150	30	0.5
1,1-Dichloroethane	59-155	30	1
1,2-Dichloroethane	49-155	30	1
1,1-Dichloroethylene	D-234	30	1
trans-1,2-Dichloroethylene	54-156	30	1
1,2-Dichloropropane	D-210	30	1
cis-1,3-Dichloropropene	D-227	30	2
trans-1,3-Dichloropropene	17-183	30	1
Ethanol	50-150	30	5000.
Ethylbenzene	37-162	30	0.5
2-Hexanone	50-150	30	5
Methylene chloride	D-221	30	0.5
2-Butanone (MEK)	50-150	30	10
4-Methyl-2-pentanone (MIBK)	50-150	30	5
Styrene	50-150	30	1
1,1,2,2-Tetrachloroethane	46-157	30	1
Tetrachloroethylene	64-148	30	1
Toluene	47-163	30	0.5
1,1,1-Trichloroethane	52-162	30	0.5
1,1,2-Trichloroethane	52-150	30	0.5
Trichloroethylene	71-157	30	1
Trichlorofluoromethane	17-181	30	1.5
Vinyl acetate	50-150	30	100
Vinyl chloride	D-251	30	0.5
Xylenes	50-150	30	1

Quality Assurance Objectives

TABLE 5-2 Quality Assurance Objectives for Wastewater / Hazardous Waste Liquid Methods

CONSTITUENT	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR ug/L
Method EPA 625/8270			
Surrogates			
2-Fluorobiphenyl	43-106	30	N/A
Nitrobenzene-d5	39-98	30	N/A
p-Terphenyl-d14	62-114	30	N/A
2-Fluorophenol	21-100	30	N/A
Phenol-d6	10-94	30	N/A
2,4,6-Tribromophenol	11-100	30	N/A
Analytes			
Acenaphthene	36-130	30	10
Acenaphthylene	33-145	30	10
Aniline	50-150	30	50
Anthracene	27-133	30	10
Benzo(a)anthracene	33-143	30	10
Benzo(a)pyrene	17-163	30	10
Benzo(b)fluoranthene	24-159	30	10
Benzo(k)fluoranthene	11-162	30	10
Benzo(g,h,i)perylene	D-219	30	10
Benzylalcohol	50-150	30	20
bis(2-Chloroethoxy)methane	33-184	30	10
bis(2-Chloroethyl)ether	12-158	30	10
bis(2-Chloroisopropyl)ether	36-166	30	10
bis(2-Ethylhexly)phthalate	29-137	30	10
4-Bromophenylphenylether	65-114	30	10
Butylbenzylphthalate	D-152	30	10
Chloroaniline	50-150	30	10
Chloronaphthalene	60-180	30	10
Chlorophenylphenylether	25-158	30	10
Chrysene	17-168	30	10
Dibenzo(a,h)anthracene	D-227	30	10
Dibenzofuran	50-150	30	10
1,2-Dichlorobenzene	32-129	30	10
1,3-Dichlorobenzene	D-172	30	10
1,4-Dichlorobenzene	33-114	30	10
3,3'-Dichlorbenzidine	8-213	30	20
Diethylphthalate	D-114	30	10
Dimethylphthalate	D-112	30	10
Di-n-butylphthalate	1-118	30	10
2,4-Dinitrotoluene	37-111	30	10
2,6-Dinitrotoluene	50-158	30	10
Di-n-octylphthalate	4-146	30	10
Fluoranthene	26-137	30	10
Fluorene	59-121	30	10
Hexachlorobenzene	50-150	30	10
Hexachlorobutadiene	24-116	30	10
Hexachlorocyclopentadiene	50-150	30	10
Hexachloroethane	40-113	30	10

Quality Assurance Objectives

TABLE 5-2 Quality Assurance Objectives for Wastewater / Hazardous Waste Liquid Methods

CONSTITUENT	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR ug/L
Method EPA 625/8270 continued			
Indeno(1,2,3-c,d)pyrene	50-150	30	10
Isophorone	21-196	30	10
2-Methylnaphthalene	50-150	30	10
Naphthalene	21-133	30	10
Nitrobenzene	35-180	30	10
N-Nitrosodimethylamine	50-150	30	10
N-Nitrosodi-N-propylamine	D-112	30	10
N-Nitrosodiphenylamine	50-150	30	10
2-Nitroanaline	50-150	30	50
3-Nitroanaline	50-150	30	50
4-Nitroanaline	50-150	30	50
Phenanthrene	54-120	30	10
Pyrene	73-119	30	10
1,2,4-Trichlorbenzene	35-122	30	10
2-Chlorophenol	27-143	30	10
2,4-Dichlorophenol	39-135	30	10
2,4-Dimethylphenol	42-109	30	10
4,6-Dinitro-o-cresol	D-181	30	50
2,4-Dinitrophenol	D-191	30	50
2-Methylphenol	50-150	30	10
4-Methylphenol	50-150	30	10
2-Nitrophenol	29-182	30	10
4-Nitrophenol	D-53	50	50
p-Chloro-m-cresol	22-147	30	20
Pentachlorophenol	D-112	30	50
Phenol	D-82	30	10
2,4,5-Trichlorophenol	50-150	30	10
2,4,6-Trichlorophenol	37-144	30	10
Method EPA 632			
Barban	30-150	30	0.5
Carbaryl	30-150	30	0.2
Carbofuran	30-150	30	30
Chlorpropham	30-150	30	0.3
Diuron	30-150	30	0.1
Fluometuron	30-150	30	100
Linoron	30-150	30	0.1
Methiocarb	30-150	30	0.2
Methomyl	30-150	30	100
Monuron	30-150	30	0.1
Neburon	30-150	30	0.1
Oxamyl	30-150	30	100
Propham	30-150	30	0.7
Propoxur	30-150	30	1
Sidoron	30-150	30	1
Swep	30-150	30	2

Quality Assurance Objectives

TABLE 5-2 Quality Assurance Objectives for Wastewater / Hazardous Waste Liquid Methods

CONSTITUENT	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR ug/L
Method EPA 415.1/9060			
TOC	80-120	20	0.5 mg/L
Method EPA 9020			
TOX	80-120	20	0.5
Method EPA 418.1			
TRPH-By IR	50-150	20	0.5 mg/L

CONSTITUENT	Method	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR mg/L
Inorganic Chemicals				
Acidity	305.1	N/A	20	1
Alkalinity (as CaCO3)	310.0	N/A	20	1
Bicarbonate	310.1	N/A	20	1
BOD	405.1	80-120	20	2
Bromide	300.0	80-120	20	0.5
Carbon Dioxide	SM4500C	N/A	20	1
Carbonate	310.1	N/A	20	1
COD	410.4	75-125	20	4
Chloride	300.0	80-120	20	1
Chlorine Residual	330.2	N/A	20	0.1
Chlorine Residual	330.5	N/A	20	0.1
Color	110.3	N/A	20	3 units
Electrical Conductivity	120.1	80-120	20	1 umhos
Cyanide, Total	335.2	75-125	20	0.01
Fluoride by electrode	340.2	80-120	20	0.1
Hydroxide	310.0	N/A	20	1
MBAS	425.1	70-130	20	0.05
Nitrogen				
Ammonia	350.1	80-120	20	1
Nitrate	300.0	80-120	20	0.1
Nitrite	300.0	80-120	20	0.1
Nitrate	353.2	80-120	20	0.1
Nitrite	353.2	80-120	20	0.1
Total Kjeldahl	351.2	80-120	20	1
Odor	140.1	N/A	20	1 TON
Oil and Grease	413.1	N/A	20	3
Oxygen, dissolved	360.1	N/A	20	0.5
pH	150.1	N/A	20	N/A
Phenols	420.1	75-125	20	0.1
Phosphorous				
phosphate	300.0	80-120	20	0.1
Total	365.2	75-125	20	0.1

Quality Assurance Objectives

TABLE 5-2 Quality Assurance Objectives for Wastewater / Hazardous Waste Liquid Methods

CONSTITUENT	Method	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR mg/L
Inorganic Chemicals continued				
Solids/Residue				
Filterable (TDS)	160.1	NA	20	40
Non-filterable (TSS)	160.2	NA	20	10
Total	160.3	NA	20	40
Volatile	160.4	NA	20	40
Settleable	160.5	NA	20	0.1 ml/L
Sulfate	300.0	80-120	20	1
Sulfide				
Total	376.2	N/A	20	0.1
Dissolved	376.2	N/A	20	0.1
Sulfite	377.1	N/A	20	0.1
Tannin & Lignin	SM5500B	N/A	20	1
Titration - pH adjust.	N/A	N/A	20	1
Turbidity	180.1	N/A	20	0.2 NTU
Trace Metals				
Aluminum	200.9	75-125	20	0.02
Aluminum	200.8	75-125	20	0.1
Antimony	200.9	75-125	20	0.02
Antimony	200.8	75-125	20	0.005
Arsenic	200.9	75-125	20	0.005
Arsenic	200.8	75-125	20	0.02
Barium	200.7	80-120	20	0.02
Barium	200.8	75-125	20	0.005
Beryllium	200.7	80-120	20	0.01
Beryllium	200.8	75-125	20	0.005
Boron	200.7	80-120	20	0.1
Boron	200.8	75-125	20	0.1
Cadmium	200.9	75-125	20	0.005
Cadmium	200.8	75-125	20	0.005
Calcium	200.7	80-120	20	1
Chromium	200.9	75-125	20	0.01
Chromium	200.8	75-125	20	0.02
Chromium VI	7196	D-120	20	0.01
Cobalt	200.7	80-120	20	0.05
Cobalt	200.8	75-125	20	0.005
Copper	200.7	80-120	20	0.05
Copper	200.8	75-125	20	0.02
Iron	200.7	80-120	20	0.05
Gold	231.1	75-125	20	0.05
Lead	200.9	75-125	20	0.01
Lead	200.8	75-125	20	0.005
Organic Lead	LUFT	50-150	20	0.05
Lithium	SM3500L	80-120	20	0.05
Magnesium	200.7	80-120	20	1
Manganese	200.7	80-120	20	0.03

Quality Assurance Objectives

TABLE 5-2 Quality Assurance Objectives for Wastewater / Hazardous Waste Liquid Methods

CONSTITUENT	Method	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR mg/L
Trace Metals continued				
Manganese	200.8	75-125	20	0.01
Mercury	245.1	75-125	20	0.0002
Mercury	245.2	75-125	20	0.0002
Molybdenum	200.7	80-120	20	0.05
Molybdenum	200.8	75-125	20	0.005
Nickel	200.7	80-120	20	0.05
Nickel	200.8	75-125	20	0.01
Potassium	200.7	80-120	20	1
Selenium	200.9	75-125	20	0.005
Selenium	200.8	75-125	20	0.02
Silica	200.7	80-120	20	1
Silver	200.9	75-125	20	0.01
Silver	200.8	75-125	20	0.005
Sodium	200.7	80-120	20	1
Strontium	200.7	80-120	20	0.05
Thallium	200.9	75-125	20	0.02
Thallium	200.8	75-125	20	0.005
Tin	200.9	75-125	20	0.05
Titanium	200.7	80-120	20	0.1
Uranium	200.7	80-120	20	0.1
Vanadium	200.7	80-120	20	0.02
Zinc	200.7	80-120	20	0.05
Zinc	200.8	75-125	20	0.05

CONSTITUENT	Method	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR pCi/L
Radiochemistry				
Gamma Emitters	901.1	80-120	20	1
Gross Alpha	900.0	60-140	30	1
Gross Beta	900.0	60-140	30	1
Radon	913.0	N/A	20	10
Strontium 90	905.0	60-140	30	1
Total Radium	900.1	75-125	20	1
Radium 226	903.1	75-125	20	1
Radium 228	904.0	75-125	20	1
Tritium	906.0	75-125	20	300
Uranium	908.0	75-125	20	1

Quality Assurance Objectives

TABLE 5-3 Quality Assurance Objectives for Solid Waste / Hazardous Waste Methods

CONSTITUENT	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR mg/Kg
Method EPA 8010			
Surrogates			
BFB	50-150	N/A	N/A
Fluorobenzene	50-150	N/A	N/A
Chlorofluorobenzene	50-150	N/A	N/A
Analytes			
Azobenzene	50-150	30	5
Benzidine	50-150	30	5
Benzoic acid	50-150	30	5
Benzylchloride	50-150	20	5
bis(2-Chloroisopropyl)ether	50-150	20	5
Bromobenzene	50-150	20	5
Bromochloromethane	50-150	20	5
Bromodichloromethane	42-172	20	5
Bromoform	13-159	20	5
Bromomethane	D-144	20	5
Carbon tetrachloride	43-143	20	5
Chlorobenzene	38-150	20	5
Chloroethane	46-137	20	5
Chloroform	49-133	20	5
1-Chlorohexane	50-150	20	5
Chloromethane	D-193	20	5
2-Chlorotoluene	50-150	20	5
Chlorotoluene	50-150	20	5
DBCP	50-150	20	5
Dibromochloromethane	24-191	20	5
1,2-Dibromoethane	50-150	20	5
Dibromomethane	50-150	20	5
1,2-Dichlorobenzene	D-208	20	5
1,3-Dichlorobenzene	7-187	20	5
1,4-Dichlorobenzene	42-143	20	5
1,1-Dichloroethane	47-132	20	5
1,2-Dichloroethane	51-147	20	5
1,1-Dichloroethylene	28-167	20	5
cis-1,2-Dichloroethylene	50-150	20	5
trans-1,2-Dichloroethylene	38-155	20	5
1,2-Dichloropropane	44-156	20	5
1,3-Dichloropropane	50-150	20	5
2,2-Dichloropropane	50-150	20	5
1,1-Dichloropropene	50-150	20	5
cis-1,3-Dichloropropene	22-178	20	5
trans-1,3-Dichloropropene	22-178	20	5
Hexachlorobutadiene	50-150	20	5
Methylene chloride	25-162	20	5
1,1,1,2-Tetrachloroethane	50-150	20	5
1,1,2,2-Tetrachloroethane	50-150	20	5
Tetrachloroethylene	26-162	20	5

Quality Assurance Objectives

TABLE 5-3 Quality Assurance Objectives for Solid Waste / Hazardous Waste Methods

CONSTITUENT	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR mg/Kg
Method EPA 8010 continued			
1,2,3-Trichlorobenzene	50-150	20	5
1,2,4-Trichlorobenzene	50-150	20	5
1,1,1-Trichloroethane	41-138	20	5
1,1,2-Trichloroethane	39-136	20	5
Trichloroethylene	35-146	20	5
Trichlorofluoromethane	21-156	20	5
Trichloropropane	50-150	20	5
Vinyl chloride	28-163	20	5
Method EPA 8011			
EDB	50-150	30	0.0005
DBCP	50-150	30	0.0005
Method EPA 8015			
Acrylamide	50-150	40	0.05
Diethyl ether	50-150	40	0.05
Ethanol	50-150	40	0.05
Methyl ethyl ketone	50-150	40	0.05
Methyl isobutyl ketone	50-150	40	0.05
Paraldehyde	50-150	40	0.05
Method EPA 8015M TPH (purgeable)			
Gas	50-150	40	5
Method EPA 8015M TPH (extractable)			
Crude oil	50-150	40	10
Diesel fuel	50-150	40	10
Hydraulic oil	50-150	40	10
Jet fuel	50-150	40	10
Stoddard solvent	50-150	40	10
Waste oil	50-150	40	50
Method EPA 8020			
Benzene	39-159	20	0.003
Chlorobenzene	55-135	20	0.003
Ethylbenzene	32-160	20	0.003
1,2-Dichlorobenzene	37-154	20	0.003
1,3-Dichlorobenzene	50-141	20	0.003
1,4-Dichlorobenzene	42-143	20	0.003
Toluene	46-148	20	0.003
Xylene, o	50-150	20	0.003
Xylene, p	50-150	20	0.003
Xylene, m	50-150	20	0.003

Quality Assurance Objectives

TABLE 5-3 Quality Assurance Objectives for Solid Waste / Hazardous Waste Methods

CONSTITUENT	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR mg/Kg
Method EPA 8040 (analyzed by method 8270)			
2-s-Butyl-4-6-dinitrophenol	50-150	30	0.1
2-Chlorophenol	23-134	30	0.1
4-Chloro-3-methylphenol	22-147	30	0.2
2,4-Dichlorophenol	39-135	30	0.1
2,4-Dimethylphenol	42-109	30	0.1
2,4-Dinitrophenol	D-191	30	0.5
2-Methyl-4,6-Dinitrophenol	D-181	30	0.5
2-Methylphenol	50-150	30	0.1
4-Methylphenol	50-150	30	0.1
2-Nitrophenol	29-182	30	0.1
4-Nitrophenol	29-182	30	0.5
Pentachlorophenol	14-176	30	0.5
Phenol	5-112	30	0.1
2,3,4,6-Tetrachlorophenol	50-150	30	0.1
2,3,5,6-Tetrachlorophenol	50-150	30	0.1
2,3,4-Trichlorophenol	37-144	30	0.1
2,3,5-Trichlorophenol	37-144	30	0.1
2,3,6-Trichlorophenol	37-144	30	0.1
2,4,5-Trichlorophenol	37-144	30	0.1
2,4,6-Trichlorophenol	37-144	30	0.1
Method EPA 8080			
Surrogates			
Hexachlorobenzene	50-150	30	N/A
Dibutylchlorendate	20-150	30	N/A
Analytes			
Aldrin	34-132	43	0.05
Alpha BHC	37-134	30	0.05
Beta BHC	17-147	30	0.05
Delta BHC	19-140	30	0.05
Chlordane	45-119	30	0.05
o,p - DDD	31-141	30	0.05
p,p - DDD	31-141	30	0.05
o,p - DDE	30-145	30	0.05
p,p - DDE	30-145	30	0.05
o,p - DDT	23-134	50	0.05
p,p - DDT	23-134	50	0.05
Dieldrin	31-134	38	0.05
Endosulfan I	45-153	30	0.05
Endosulfan II	D-202	30	0.05
Endosulfan sulfate	26-144	30	0.05
Endrin	42-139	45	0.05
Endrin aldehyde	50-150	30	0.05
Heptachlor	35-130	30	0.05
Heptachlor epoxide	37-142	30	0.05
Lindane	46-127	50	0.05

Quality Assurance Objectives

TABLE 5-3 Quality Assurance Objectives for Solid Waste / Hazardous Waste Methods

CONSTITUENT	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR mg/Kg
Method EPA 8080 continued			
Methoxychlor	50-150	30	0.1
Toxaphene	41-126	30	0.1
PCB 1016	50-114	30	0.5
PCB 1221	15-178	30	0.5
PCB 1232	10-215	30	0.5
PCB 1242	39-150	30	0.5
PCB 1248	38-158	30	0.5
PCB 1254	29-131	30	0.5
PCB 1260	8-127	30	0.5
Method EPA 8140			
Surrogates			
1,3-Dimethyl-2-nitrobenzene	50-150	30	N/A
9-Nitroanthracene	50-150	30	N/A
Analytes			
Azinphos methyl	50-150	30	0.02
Bolstar	50-150	30	0.02
Chlorpyrifos	50-150	30	0.02
Coumaphos	50-150	30	0.02
Demeton-o,s	50-150	30	0.02
Diazinon	50-150	30	0.02
Dichlorvos	50-150	30	0.02
Disulfoton	50-150	30	0.02
Ethoprop	50-150	30	0.02
Fensulfoton	50-150	30	0.02
Fenthion	50-150	30	0.02
Merphos	50-150	30	0.02
Mevinphos	50-150	30	0.02
Naled	50-150	30	0.02
Parathion methyl	50-150	30	0.02
Phorate	50-150	30	0.02
Ronnel	50-150	30	0.02
Stirophos	50-150	30	0.02
Tokuthion	50-150	30	0.02
Trichlornate	50-150	30	0.02
Method EPA 8150			
Surrogate			
2,4-DCAA	30-150	N/A	N/A
Analytes			
Bentazon	30-150	30	0.2
Chloramben	30-150	30	0.1
2,4-D	30-150	30	1
Dalapon	30-150	30	0.1
2,4-DB	30-150	30	1
Dicamba	30-150	30	0.1

Quality Assurance Objectives

TABLE 5-3 Quality Assurance Objectives for Solid Waste / Hazardous Waste Methods

CONSTITUENT	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR mg/Kg
Method EPA 8150 continued			
Dichlorprop	30-150	30	0.2
Dinoseb	30-150	30	0.1
Pentachlorophenol	30-150	30	0.1
Picloram	30-150	30	0.1
2,4,5-T	30-150	30	0.1
2,4,5-TP (Silvex)	30-150	30	0.2
Method EPA 8240			
Surrogates			
1,2-Dichloroethane-d4	61-164	N/A	N/A
Toluene-d8	81-117	N/A	N/A
BFB	67-124	N/A	N/A
Analytes			
Acetone	50-150	30	0.01
Acrolein	50-150	30	0.1
Acrylonitrile	50-150	30	0.1
Benzene	66-142	21	0.005
Bromodichloromethane	35-155	30	0.005
Bromoform	45-169	30	0.005
Bromomethane	D-242	30	0.01
Carbon disulfide	50-150	30	0.005
Carbon tetrachloride	70-140	30	0.005
Chlorobenzene	60-133	21	0.005
Chloroethane	14-230	30	0.01
2-Chloroethylvinyl ether	50-150	30	0.01
Chloroform	51-138	30	0.005
Chloromethane	D-273	30	0.01
Dibromochloromethane	53-149	30	0.005
1,2-Dichlorobenzene	50-150	30	0.005
1,3-Dichlorobenzene	50-150	30	0.005
1,4-Dichlorobenzene	50-150	30	0.005
Dichlorodifluoromethane	50-150	30	0.0005
1,1-Dichloroethane	59-172	21	0.005
1,2-Dichloroethane	49-155	30	0.005
1,1-Dichloroethylene	D-234	30	0.005
trans-1,2-Dichloroethylene	54-156	30	0.005
1,2-Dichloropropane	D-210	30	0.005
cis-1,3-Dichloropropene	D-227	30	0.005
trans-1,3-Dichloropropene	17-183	30	0.005
Ethanol	50-150	30	10
Ethylbenzene	37-162	30	0.005
2-Hexanone	50-150	30	0.005
Methylene chloride	D-221	30	0.005
2-Butanone (MEK)	50-150	30	0.01
4-Methyl-2-pentanone (MIBK)	50-150	30	0.005
Styrene	50-150	30	0.005

Quality Assurance Objectives

TABLE 5-3 Quality Assurance Objectives for Solid Waste / Hazardous Waste Methods

CONSTITUENT	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR mg/Kg
Method EPA 8240 continued			
1,1,2,2-Tetrachloroethane	46-157	30	0.005
Tetrachloroethylene	64-148	30	0.005
Toluene	59-139	21	0.005
1,1,1-Trichloroethane	52-162	30	0.005
1,1,2-Trichloroethane	52-150	30	0.005
Trichlorethylene	62-137	24	0.005
Trichlorofluoromethane	17-181	30	0.005
Vinyl acetate	50-150	30	0.1
Vinyl chloride	D-251	30	0.01
Xylenes	50-150	30	0.005
Method EPA 8270			
Surrogates			
2-Fluorobiphenyl	30-115	30	N/A
Nitrobenzene-d5	23-120	30	N/A
p-Terphenyl-d14	18-137	30	N/A
2-Fluorophenol	25-121	30	N/A
Phenol-d6	24-113	30	N/A
2,4,6-Tribromophenol	19-122	30	N/A
Analytes			
Acenaphthene	31-137	19	1
Acenaphthylene	33-145	30	1
Aniline	50-150	30	5
Anthracene	27-133	30	1
Benzo(a)anthracene	33-143	30	1
Benzo(a)pyrene	17-163	30	1
Benzo(b)fluoranthene	24-159	30	1
Benzo(k)fluoranthene	11-162	30	1
Benzo(g,h,i)perylene	D-219	30	1
Benzylalcohol	50-150	30	2
bis(2-Chloroethoxy)methane	33-184	30	1
bis(2-Chloroethyl)ether	12-158	30	1
bis(2-Chloroisopropyl)ether	36-166	30	1
bis(2-Ethylhexyl)phthalate	29-137	30	1
4-Bromophenylphenylether	65-114	30	1
Butylbenzylphthalate	D-152	30	1
Chloroaniline	50-150	30	2
Chloronaphthalene	60-180	30	1
Chlorophenylphenylether	25-158	30	1
Chrysene	17-168	30	1
Dibenzo(a,h)anthracene	D-227	30	1
Dibenzofuran	50-150	30	1
1,2-Dichlorobenzene	32-129	30	1
1,3-Dichlorobenzene	D-172	30	1
1,4-Dichlorobenzene	28-104	27	1
3,3'-Dichlorobenzidine	8-213	30	2

Quality Assurance Objectives

TABLE 5-3 Quality Assurance Objectives for Solid Waste / Hazardous Waste Methods

CONSTITUENT	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR mg/Kg
Method EPA 8270 continued			
Diethylphthalate	D-114	30	1
Dimethylphthalate	D-112	30	1
Di-n-butylphthalate	1-118	30	1
2,4-Dinitrotoluene	28-100	47	1
2,6-Dinitrotoluene	50-158	30	1
Di-n-octylphthalate	4-146	30	1
Fluoranthene	26-137	30	1
Fluorene	59-121	30	1
Hexachlorobenzene	50-150	30	1
Hexachlorobutadiene	24-116	30	1
Hexachlorocyclopentadiene	50-150	30	2
Hexachloroethane	40-113	30	1
Indeno(1,2,3-c,d)pyrene	50-150	30	1
Isophorone	21-196	30	1
2-Methylnaphthalene	50-150	30	1
Naphthalene	21-133	30	1
Nitrobenzene	35-180	30	1
N-Nitrosodimethylamine	50-150	30	1
N-Nitrosodi-N-propylamine	41-126	38	1
N-Nitrosodiphenylamine	50-150	30	1
2-Nitroanaline	50-150	30	5
3-Nitroanaline	50-150	30	5
4-Nitroanaline	50-150	30	5
Phenanthrene	54-120	30	1
Pyrene	35-142	36	1
1,2,4-Trichlorbenzene	38-107	23	1
2-Chlorophenol	25-102	50	1
2,4-Dichlorophenol	39-135	30	1
2,4-Dimethylphenol	42-109	30	1
4,6-Dinitro-o-cresol	D-181	30	5
2,4-Dinitrophenol	D-191	30	5
2-Methylphenol	50-150	30	1
4-Methylphenol	50-150	30	1
2-Nitrophenol	29-182	30	1
4-Nitrophenol	11-114	50	5
p-Chloro-m-cresol	26-103	33	2
Pentachlorophenol	17-109	47	5
Phenol	26-90	35	1
2,4,5-Trichlorophenol	50-150	30	1
2,4,6-Trichlorophenol	37-144	30	1
Azobenzene	50-150	30	5
Benzidine	50-150	30	5
Benzoic Acid	50-150	30	5

Quality Assurance Objectives

TABLE 5-3 Quality Assurance Objectives for Solid Waste / Hazardous Waste Methods

CONSTITUENT	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR ug/Kg
Method EPA 8310			
Acenaphthene	70-130	20	3
Acenaphthylene	70-130	20	2
Anthracene	70-130	20	0.1
Benzo(a)anthracene	70-130	20	0.1
Benzo(b)fluoranthene	70-130	20	0.2
Benzo(k)fluoranthene	70-130	20	0.1
Benzo(g,h,i)perylene	70-130	20	0.1
Benzo(a)pyrene	70-130	20	0.2
Chrysene	70-130	20	0.1
Dibenzo(a,h)anthracene	70-130	20	0.3
Fluoranthene	70-130	20	2
Fluorene	70-130	20	2
Indeno(1,2,3-c,d)pyrene	70-130	20	0.1
Naphthalene	70-130	20	2
Phenanthrene	70-130	20	2
Pyrene	70-130	20	0.1
Method EPA 9060			
TOC	80-120	20	50
Method EPA 9020			
TOX	80-120	20	1
EPA Method 418.1M			
TRPH-By IR	50-150	20	10

CONSTITUENT	Method	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR mg/Kg
Inorganic Chemicals				
Chloride	9056	70-130	30	10
Electrical Conductivity	120.1	80-120	20	1 umhos
Cyanide, Total	335.2	65-135	30	1
Fluoride	335.2	65-135	30	50
Moisture	ASA/UL	N/A	20	N/A
Nitrogen				
Ammonia-N	350.1	70-130	30	4
Nitrate	9056	70-130	30	4
Nitrite	9056	70-130	30	3
Organic	Calc.	N/A	30	100
Kjeldahl	351.1	65-135	30	100
Total	Calc.	N/A	30	100
Oil and Grease, Soxhlet	413.1	N/A	30	300
pH	150.1	N/A	20	N/A
Phenols	420.1	65-135	30	5

Quality Assurance Objectives

TABLE 5-3 Quality Assurance Objectives for Solid Waste / Hazardous Waste Methods

CONSTITUENT	Method	DLR % REC-AR	ACCURACY RPD-MAV	PRECISION mg/Kg
Inorganic Chemicals				
Phosphorous				
Phosphate	9056	70-130	30	3
Total (see Trace Metals)				
Sulfate	9056	70-130	30	10
Sulfide	376.2	N/A	30	5
Hazardous Waste Characterization				
Corrosivity (pH)	9045	20.0	N/A	N/A
Ignitability	1020	N/A	N/A	N/A
Reactivity	SW-846	N/A	N/A	N/A
Generation	SW-846	N/A	N/A	N/A
Trace Metals				
Aluminum	6010	70-130	30	50
Aluminum	6020	70-130	30	20
Antimony	7041	65-135	30	3
Antimony	6020	65-135	30	1
Arsenic	7060	65-135	30	1
Arsenic	6020	65-135	30	4
Barium	6010	70-130	30	1
Barium	6020	70-130	30	1
Beryllium	6010	70-130	30	0.5
Beryllium	6020	70-130	30	1
Boron	6010	70-130	30	5
Boron	6020	70-130	30	5
Cadmium	6010	70-130	30	3
Cadmium	6020	70-130	30	1
Calcium	6010	70-130	30	50
Chromium	6010	70-130	30	3
Chromium	6020	70-130	30	4
Chromium VI	7196	D-130	30	0.2
Cobalt	6010	70-130	30	3
Cobalt	6020	70-130	30	4
Copper	6010	70-130	30	3
Copper	6020	70-130	30	4
Gold	231.1	70-130	30	3
Iron	6010	70-130	30	3
Lead	7420	70-130	30	4
Lead	6020	70-130	30	1
Organic Lead	LUFT	50-150	20	4
Lithium	7430	70-130	30	3
Magnesium	6010	70-130	30	50
Manganese	6010	70-130	30	2
Manganese	6020	70-130	30	2
Mercury	7471	65-135	30	0.01

Quality Assurance Objectives

TABLE 5-3 Quality Assurance Objectives for Solid Waste / Hazardous Waste Methods

CONSTITUENT	Methods	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR mg/Kg
Trace Metals continued				
Molybdenum	6010	70-130	30	3
Molybdenum	6020	70-130	30	1
Nickel	6010	70-130	30	3
Nickel	6020	70-130	30	2
Phosphorous, Total	6010	65-135	30	50
Potassium	6010	70-130	30	50
Selenium	7740	65-135	30	3
Selenium	6020	65-135	30	4
Silver	6010	70-130	30	3
Silver	6020	70-130	30	1
Sodium	6010	70-130	30	50
Strontium	6010	65-135	30	3
Thallium	7841	65-135	30	3
Thallium	6020	65-135	30	1
Tin	6010	65-135	30	3
Titanium	6010	65-135	30	5
Uranium	6010	65-135	30	5
Vanadium	6010	70-130	30	1
Zinc	6010	70-130	30	3
Zinc	6020	70-130	30	10

CONSTITUENT	Method	ACCURACY % REC-AR	PRECISION RPD-MAV	DLR pCi/Kg
Radiochemistry				
Gamma Emitters	901.1	80-120	20	1
Gross Alpha	900.0	60-140	30	1
Gross Beta	900.0	60-140	30	1
Radon	913.0	N/A	20	10
Strontium 90	905.0	60-140	30	1
Total Radium	900.1	75-125	20	1
Radium 226	903.1	75-125	20	1
Radium 228	904.0	75-125	20	1
Tritium	906.0	75-125	20	300
Uranium	908.0	75-125	20	1

Sampling Procedures

Sample collection and sample handling techniques are important aspects of the overall sample analysis process and have a major impact on the quality and validity of the results. Specific containers and preservatives are used to ensure that sample integrity is not lost through volatility or degradation. In addition, contaminants that are likely to interfere or effect the quality of analytical data must be minimized or eliminated. If a client chooses to collect their own samples, experienced lab staff can brief clients by telephone on the proper methods of sample collection. Detailed procedures to ensure sampling consistency and compliance with method requirements are available. The correct container types, bottle sizes, preservatives, container closures, and holding times for sampling are shown in Table 6-1.

6.1 General Precautions

The result of any analytical determination can be no better than the sample on which it is performed. The objective is to obtain a sample that meets the requirements of the sampling program and manage it in such a way that it does not deteriorate or become contaminated before reaching the laboratory. This objective implies that the relative proportions or concentrations of all pertinent components will be the same in the samples as in the material being sampled, and that the sample will be processed in such a way that no significant changes in composition occur before the tests are made.

A sample may be presented to the laboratory for specific determinations with the collector taking responsibility for its validity. Often the laboratory conducts or prescribes the sampling program which is determined in consultation with the user of the test results. Such consultation is essential to ensure the selection of the appropriate sample and analytical methods that provide a true basis for answering the questions that prompted the sampling.

Before filling, rinse the sample bottle two or three times with the water being collected, unless the bottle contains a preservative. Depending on determinations to be performed, fill container full (most organics determinations) or leave space for aeration, mixing, etc. (microbiological analyses). For samples that will be shipped, preferably leave an air space of about one (1) percent of container capacity to allow for thermal expansion. Special precautions are necessary for samples containing organic compounds and trace metals. Because many constituents may be present at concentrations of micrograms per liter, they may be totally or partially lost if proper sampling and preservation procedures are not followed.

Representative samples of some sources can be obtained only by making composites of samples collected over a period of time or at many different sampling points. The details of collection vary so much with local conditions that no specific recommendations would be universally applicable. Sometimes it is more informative to analyze numerous separate samples instead of one composite so as not to obscure high and low results.

Sample carefully to ensure that analytical results represent the actual sample composition. The following are several important factors affecting results: the presence of suspended matter or turbidity; the method chosen for its removal, and; the physical and chemical changes brought about by storage or aeration.

Particular care is required when processing (grinding, blending, sieving, filtering) samples to be analyzed for trace constituents, especially metals and organic compounds. Some determinations, particularly of lead, can be invalidated by contamination from such processing.

Sampling Procedures

6.1 General Precautions continued

Treat each sample individually with regard to the substances to be determined, the amount and nature of turbidity present, and other conditions that may influence the results.

It is impractical to give directions covering all conditions. The choice of technique for collecting a homogeneous sample must be left to the analyst's judgment. In general, separate any significant amount of suspended matter by decantation, centrifugation, or an appropriate filtration procedure. Often a slight turbidity can be tolerated if experience shows that it will cause no interference in gravimetric or volumetric tests. Its influence can be corrected in colorimetric tests, where it has potentially the greatest interfering effect. When relevant, state whether or not the sample has been filtered. To measure the total amount of a constituent, do not remove suspended solids, but treat them appropriately.

Make a record of every sample collected and identify every bottle, preferably by attaching an appropriately inscribed tag or label. Record sufficient information to provide positive sample identification at a later date. Include the name of the sample collector, the date, hour, and exact location, the water temperature, and any other data that may be needed for correlation, such as weather conditions, water level, stream flow, post-sampling handling, etc. Provide space on the label for the initials of those assuming sample custody and for the time and date of transfer. Identify sampling points by detailed description, by maps, or with the aid of stakes, buoys, or landmarks in a manner that will permit their identification by other persons without reliance on memory or personal guidance. When sample results are expected to be involved in litigation, it is recommended to use formal "chain-of-custody" procedures which trace sample history from collection to final reporting.

Hot samples collected under pressure should be cooled while still under pressure.

Before collecting samples from distribution systems, flush lines sufficiently to insure that the sample is representative of the supply, taking into account the diameter and length of the pipe to be flushed and the velocity of flow.

Collect samples from wells only after the well has been pumped sufficiently to insure that the sample represents the groundwater source. Sometimes it will be necessary to pump at a specified rate to achieve a characteristic drawdown, if this determines the zones from which the well is supplied. Record pumping rate and drawdown.

When samples are collected from a river or stream, observed results may vary with depth, stream flow, and distance from shore and from one shore to the other. If equipment is available, take an "integrated" sample from top to bottom in the middle of the stream or from side to side at mid-depth.

Lakes and reservoirs are subject to considerable variations from normal causes such as seasonal stratification, rainfall, runoff, and wind. Choose location, depth, and frequency of sampling to reflect local conditions and the purpose of the investigation. Avoid surface scum.

Sampling Procedures

6.1 General Precautions continued

For certain constituents, sampling location is extremely important. Avoid areas of excessive turbulence because of potential loss of volatile constituents and of potential presence of toxic vapors. Avoid sampling at weirs because such locations tend to favor retrieval of lighter-than-water, immiscible compounds. Generally, collect samples beneath the surface in quiescent areas. If composite samples are required, take care that sample constituents are not lost during compositing because of improper handling of the sample being pooled. For example, casual dumping together of portions rather than addition to the composite through a submerged siphon can cause unnecessary volatilization.

Use only representative samples (or those conforming to a sampling program) for examination. The great variety of conditions under which collections must be made makes it impossible to prescribe a fixed procedure. In general, take into account the tests or analyses to be made and the purpose for which the results are needed.

6.1.2 Field Notebook

The sampler or field investigator should keep a field notebook (preferably bound with pages numbered) to record sample collection procedures, dates, laboratory identification, sample collection location, and the name of the sampler. This is important for later recall or legal challenge.

6.2 Sample Collection

6.2.1 Water Sampling

6.2.1.1 Grab or Catch Samples

Strictly speaking, a sample collected at a particular time and place can represent only the composition of the source at that time and place. However, when a source is known to be fairly constant in composition over a considerable period of time or over substantial distances in all directions, then the sample may be said to represent a longer time period or a larger volume, or both, than the specific point at which it was collected. In such circumstances, some sources may be fairly represented by single grab samples. Examples are some water supplies, some surface waters, and rarely, some wastewater streams. When a source is known to vary with time, grab samples collected at suitable intervals and analyzed separately can document the extent, frequency, and duration of these variations. Choose sampling intervals on the basis of the frequency with which changes may be expected, which may vary from as little as five (5) minutes to as long as one (1) hour or more. Seasonal variations in natural systems may necessitate sampling over months. When the source composition varies in space rather than time, collect samples from appropriate locations.

Use great care in sampling wastewater, sludges, sludge banks, and muds. No definite procedure can be given, but take every possible precaution to obtain a representative sample or one conforming to a sampling program.

Sampling Procedures

6.2.1.2 Composite Samples

In most cases, the term "composite sample" refers to a mixture of grab samples collected at the same sampling point at different times. Sometimes the term "time-composite" is used to distinguish this type of sample from others. Time- composite samples are most useful for observing average concentrations that will be used, for example, in calculating the loading or the efficiency of a wastewater treatment plant. As an alternative to the separate analysis of a large number of samples and the computation of average and total results, composite samples represent a substantial saving in laboratory effort and expense. For these purposes, a composite sample representing a 24 hour period is considered standard for most determinations. Under certain circumstances, however, a composite sample representing one shift, or a shorter time period, or a complete cycle of a periodic operation, may be preferable. To evaluate the effects of special, variable, or irregular discharges and operations, collect composite samples representing the period during which such discharges occur.

For determining components or characteristics subject to significant and unavoidable changes on storage, do not use composite samples. Make such determinations on individual samples as soon as possible after collection and preferably at the sampling point. Analyses for all dissolved gases, residual chlorine, soluble sulfide, temperature, and pH are examples of this type of determination. Changes in such components as dissolved oxygen or carbon dioxide, pH, or temperature may produce secondary changes in certain inorganic constituents such as iron, manganese, alkalinity, or hardness. Use time-composite samples only for determining components that can be demonstrated to remain unchanged under the conditions of sample collection and preservation.

Take individual portions in a bottle having a diameter of at least 35 mm at the mouth and a capacity of at least 120 mL. Collect these portions every hour, in some cases every half hour or even every five (5) minutes, and mix at the end of the sampling period or combine in a single bottle as collected. If preservatives are used, add them to the sample bottle initially so that all portions of the composite are preserved as soon as collected. Analysis of individual samples sometimes may be necessary. It is desirable, and often essential, to combine individual samples in volumes proportional to flow. A final sample volume of 2 to 3 L is sufficient for sewage, effluents, and wastes.

Automatic sampling devices are available; however, do not use them unless the sample is preserved as described below. Clean sampling devices, including bottles, daily to eliminate biological growths and other deposits.

6.2.1.3 Integrated Samples

For certain purposes, the information needed is provided best by analyzing mixtures of grab samples collected from different points simultaneously, or as nearly so as possible. Such mixtures sometimes are called integrated samples. An example of the need for such sampling occurs in a river or stream that varies in composition across its width and depth. To evaluate average composition or total loading, use a mixture of samples representing various points in the cross-section, in proportion to their relative flows. The need for integrated samples also may exist if combined treatment is proposed for several separate wastewater streams, the interation of which may have a significant effect on treatability or even on composition. Mathematical prediction of the interactions may be inaccurate or impossible and testing a suitable integrated sample may provide more useful information.

Sampling Procedures

6.2.1.3 Integrated Samples continued

Both natural and artificial lakes show variations of composition with both depth and horizontal location. However, under many conditions, neither total nor average results are especially significant; local variations are more important. In such cases, examine samples separately rather than integrate them.

Preparation of integrated samples usually requires special equipment to collect a sample from a known depth without contaminating it with overlying water. Knowledge of the volume, movement, and composition of the various parts of the water being sampled usually is required. Therefore, collecting integrated samples is a complicated and specialized process that cannot be described in detail.

6.2.2 Soil Sampling

Soil samples collected from a backhoe, the ground or a soil coring device, should be collected in a thin-walled stainless steel or brass cylinder at least three inches long byone inch in diameter that has been prepared by the laboratory doing the analysis or the project consultant (cylinders can be made to fit inside the preferred split- barrel core sampler). About one inch of soil should be removed from the immediate surface area where the sample is to be taken and the cylinder then pounded in to the soil with a mallet or hammer. No headspace should be present in the cylinder once the sample is collected. When the sample is collected, each end of the cylinder should be covered with teflon tape and then capped with a polyethylene lid, taped and labeled. The sample should be immediately placed in an ice chest and kept cool at 4 C for delivery to the laboratory. Care should be taken throughout, to avoid contamination of both the inside and outside of the cylinder and its contents.

In situations where the above procedure is inappropriate (i.e. semi-solid samples), glass vials with Teflon seal and screw cap should be used.

6.2.3 Special Sampling Considerations

6.2.3.1 Volatile Organics including Organic Lead

When collecting the samples, liquids and solids should be introduced into the vials gently to reduce agitation which might drive off volatile compounds. Liquid samples should be poured into the vial without introducing any air bubbles within the vial as it is being filled. Should bubbling occur as a result of violent pouring, the sample must be poured out and the vial refilled. Each VOA vial should be filled until there is a meniscus over the lip of the vial. The screw-top lid with the septum (Teflon side toward the sample) should then be tightened onto the vial. After tightening the lid, the vial should be inverted and tapped to check for air bubbles. If there are any air bubbles present the sample must be retaken. Two VOA vials should be filled per sample location.

VOA vials for samples with solid or semi-solid (sludges) matrices should be completely filled as best as possible. The vials should be tapped slightly as they are filled to eliminate as much free air space as possible. Two vials should also be filled per sample location.

Sampling Procedures

6.2.3.1 Volatile Organics including Organic Lead continued

VOA vials should be filled and labeled immediately at the point at which the sample is collected. They should NOT be filled near a running motor or any type of exhaust system because discharged fumes and vapors may contaminate the samples. The two vials from each sampling location should then be sealed in separate plastic bags to prevent cross- contamination between samples particularly if the sampled waste is suspected of containing high levels of volatile organics. (Activated carbon may also be included in the bags to prevent cross-contamination from highly contaminated samples). VOA samples may also be contaminated by diffusion of volatile organics through the septum during shipment and storage. To monitor possible contamination, a trip blank prepared from distilled deionized water should be carried throughout the sampling, storage, and shipping process.

6.2.3.2 Semivolatile Organics including Pesticides and Herbicides

Containers used to collect samples for the determination of semivolatile organic compounds should be soap and water washed followed by methanol (or isopropanol) rinsing. The sample containers should be of glass or Teflon and have screw-top covers with Teflon liners. In situations where Teflon is not available, samples may react with the aluminum foil, causing eventual contamination of the sample. Plastic containers or lids may NOT be used for the storage of samples due to the possibility of sample contaminat ion from the phthalate esters and other hydrocarbons within the plastic. Sample containers should be filled with care so as to prevent any portion of the collected sample coming in contact with the field persons gloves, thus causing contamination. Samples should not be collected or stored in the presence of exhaust fumes. If the sample comes in contact with the an automatic sampler run reagent water through the sampler and use as a field blank.

6.2.3.3 Trace Metals

In the determination of trace metals, containers can introduce either positive or negative errors in the measurement of trace metals by (a) contributing contaminants through leaching or surface desorption, and (b) depleting concentrations through adsorption.Thus the collection and treatment of the sample prior to analysis require particular attention.

6.2.3.4 Radiochemistry

6.2.3.4.1 Radon

Sample by slowly running water into a 2 liter or greater bucket until it overflows for 5 minutes. The water entering the bucket should be as free as possible of bubbles. Fill duplicate 250 mL glass boston round bottles under water, taking care to release all of the air bubbles from inside the bottle. Cap each bottle tightly whil still under water. Dry the bottles and place electrical tape around the cap. Record the date and time. Ship immediately to the laboratory and keep the samples cool at 4 C.

6.2.3.4.1 Radium

The sample should be acidified at the time of sampling.

Sampling Procedures

6.2.3.5 Product Samples

Free Floating Product (from a well): Sampling of free floating product on the surface of ground water should not be performed until the well has been allowed to stabilize for at least 24 hours after development or other withdrawal procedure. A sample should be collected that is indicative of the thickness of floating product within the monitoring well. This may be accomplished by the use of a clear, acrylic bailer designed to collect a liquid sample where free product and ground water meet. A graduated scale on the bailer is helpful for determining the thickness of free product. Samples should be field-inspected for the presence of odor and/or sheen in addition to the aboveevaluation.

Electronic measuring devices also are available for determining the thickness of the hydrocarbon layer floating on ground water.

6.2.3.6 Aqueous/Dissolved Product

If free product (from a well) is detected, analysis of water for dissolved product should be conducted after the free product has been substantially removed from the well. Before collecting a water sample, a well should be purged until temperature, conductivity and pH stabilize. Often, this will require removal of four or more well volumes by bailing or pumping. Once well volumes are removed and well water is stabilized, a sample can be taken after the water level approaches 80 percent of its initial level. Where water level recovery is slow, the sample can be collected after stabilization is achieved.

Ground water samples should be collected in a manner which reduces or eliminates the possibility of loss of volatile constituents from the sample. For collecting samples, a gas-actuated positive displacement pump or a submersible pump is preferred. A Teflon or stainless steel bailer is acceptable. Peristaltic pumps or airlift pumps should not be used.

Cross-contamination from transferring pumps (or bailers) from well to well can occur and should be avoided by thorough cleaning between sampling episodes. Dedicated (i.e., permanent installation) well pumps, while expensive, are often cost effective in the long term and ensure data reliability relative to cross-contamination. If transfer of equipment is necessary, sampling should proceed from the least contaminated to the most contaminated well, if the latter information is available before sample collection.

Water samples should be collected in vials or containers specifically designed to prevent loss of volatile constituents from the sample. These vials should be provided by an analytical laboratory, and preferably, the laboratory conducting the analysis. No headspace should be present in the sample container once the container has been capped. This can be checked by inverting the bottle, once the sample is collected, and looking for bubbles. Sometimes it is not possible to collect a sample without air bubbles, particularly if water is aerated. In these cases, the investigator should record the problem and account for probable error. Cooling samples may also produce headspace (bubbles), but these will disappear once the sample is warmed for analysis.

Samples should be placed in an ice chest maintained at 4 C with blue ice (care should be taken to prevent freezing of the water and bursting of the glass vial). A thermometer with a protected bulb should be carried in each ice chest.

Sampling Procedures

6.3 Sample Handling Policy

Proper sample containers, sample volumes, preservatives, and holding times are essential to providing reliable data. Table 6-1 provides information for each of these items. FGL references the following sources for compiling Table 6-1.

(1) Federal Register, Volume 49, No. 209, October 26, 1984 and subsequent updates.
(2) "Handbook for Sampling and Sample Preservation of Water and Wastewater", EPA Method Book, EPA-600/4-82-029, September 1982.
(3) "Methods for Chemical Analysis in Waters and Waste" (MCAWW) EPA-600/4-79-020
(4) "Methods for Evaluating Solid Waste", EPA Method Book, SW- 846, rev. 3, and Proposed Revisions.
(5) "Standard Methods for the Analysis of Water and Wastewater", 17th Edition, 1990.
(6) "Methods for the Determination of Organic Compounds in Drinking Water", EPA Method Book, EPA-600/4-88-039, December 1988.
(7) "Methods for the Determination of Organic Compounds in Drinking Water-Supplement I", EPA Method Book, EPA-600/4- 90-020, July 1990.
(8) "Methods for the Determination of Organic Compounds in Drinking Water-Supplement II", EPA Method Book, EPA-600/4- 90-020, July 1990.
(9) "Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater", EPA Method Book, EPA 600/4-82-057, July 1982.
(10) "Prescribed Procedures for Measurement of Radioactivity in Drinking Water", EPA Method Book, EPA-600/4-80-032, August 1980.

6.3.1 Container Check Policy

Sample bottles for most analyses, such as metals, and organics analyses, are purchased precleaned according to EPA Protocol specification from various vendors. Cases of sample bottles are logged in upon receipt. The log book contains the bottle type, lot number or manufacture date, receive date and number of cases. This information is also recorded on the document provided by the manufacturer and is retained in a file for that bottle type. Most containers are checked and documented by the manufacturer. Bacteriology and Santa Paula metals bottles must be checked in-house by lot or on a manufacture date basis. If neither of these are available then one container must be checked from every ten cases. The following files are to be maintained for storing certificates or in-house analysis data:

40 mL VOA - for all VOA styles
125 mL Boston Round (B.R.) - for all 125 mL B.R. bottle styles
250 mL Boston Round (B.R.) - for all 250 mL B.R. bottle styles
1 L Boston Round (B.R.)
250 mL Wide Mouth (W.M.)
1 Qt. Wide Mouth (W.M.)
4 oz. Bact
500 mL Plastic (SP only, for Al, Sb, As, Ba, Be, Cd, Ca, Cr, Co, Cu, Fe, Pb, Mg, Mn, Hg, Ni, K, Se, Ag, Na, Tl, V, Zn)

For those bottles not listed and not verified (such as 1 Qt plastic) it has been determined that the tests performed from those containers are not at risk from contamination by the container.

Sampling Procedures

6.3.1 Container Check Policy continued

When an in-house verification is required the sample is given a lab number, chain-of-custody and is treated as a regular sample. The results are formally reported but only the signature of the QA Director or Officer to verify cleanliness is required prior to filing.

Lots determined to be contaminated are returned and replaced.

6.3.2 Shipping Samples

Prior to shipment of samples, all documentation must be ready for proper chain of custody. The information necessary for documenting chain of custody is outlined in the following section of the quality assurance manual (section 7). After filling out the proper sample documentation, the samples and documents should be placed in an ice chest with adequate protection. Normally "Blue Ice" is used for keeping samples cool. However, dry ice may be used if approved by Department of Transportation (DOT).

6.3.3 Sample Kits

FGL Environmental supplies the appropriate sample containers, preservatives, chain-of-custody forms, coolers with blue ice, and packing materials to client upon request. There is no charge for these services as long as FGL is the laboratory receiving the samples for analysis. Arrangements for sample kits may be made through the client services department.

Sampling Procedures

TABLE 6-1 RECOMMENDED SAMPLE COLLECTION AND PRESERVATION

Analysis	Container	Volume (mL)	Preservation	Holding Time
General Inorganic Chemistry				
Acidity	P,G	250	Cool, 4 C	14 days
Alkalinity	P,G	250	Cool, 4 C	14 days
Asbestos	G	1000	Cool, 4 C	48 hr.
Bicarbonate	P	250	Cool, 4 C	14 days
Biochemical Oxygen Demand	P,G	1000	Cool, 4 C	48 hr.
Boron	P	250	Cool, 4 C	6 mo.
Bromide	P	250	Cool, 4 C	28 days
Carbonate	P	250	Cool, 4 C	14 days
Carbon Dioxide	P,G	250	Cool, 4 C	immed.
Chemical Oxygen Demand	P,G	250	H_2SO_4, pH<2; Cool, 4 C	28 days
Chloride	P,G	250	Cool, 4 C	28 days
Chlorine Residual	P,G	500	Cool, 4 C	2 hr.
Chlorine Demand	P,G	2000	Cool, 4 C	2 hr.
Color	P,G	250	Cool, 4 C	48 hr.
Cyanide, Total	P,G	1000	NaOH, pH>12; Cool, 4 C	14 days
Electrical Conductivity	P	250	Cool, 4 C	28 days
Fluoride	P,G	250	Cool, 4 C	28 days
Hardness, Total	P,G	250	HNO_3, pH<2; Cool, 4 C	6 mo.
Hydroxide	P,G	250	Cool, 4 C	14 days
Iodide	P,G	250	Cool, 4 C	24 hr.
Langelier Index	P,G	500	Cool, 4 C	2 hr.
MBAS	P,G	500	Cool, 4 C	48 hr.
Nitrogen,				
Ammonia	P,G	250	H_2SO_4, pH<2; Cool, 4 C	28 days
Nitrate+Nitrite	P,G	250	H_2SO_4, pH<2; Cool, 4 C	28 days
Nitrate	P,G	250	Cool, 4 C	48 hr.
Nitrite	P,G	250	Cool, 4 C	48 hr.
Organic	P,G	400	H_2SO_4, pH<2; Cool, 4 C	28 days
Total	P,G	250	H_2SO_4, pH<2; Cool, 4 C	28 days
Total Kjeldahl	P,G	250	H_2SO_4, pH<2; Cool, 4 C	28 days
Odor	G	500	Cool, 4 C	24 hr.
Oil and Grease	G	1000	H_2SO_4, pH<2; Cool, 4 C	28 days
Oxygen, Dissolved	G w/glass stopper	250	Cool, 4 C	immed.
pH	P,G	250	Cool, 4 C	2 hr.
Phenolics	G	500	H_2SO_4, pH <2; Cool, 4 C	28 days

P = plastic, G = glass

Note: All solid samples should be collected in stainless steel sleeves, brass sleeves or in glass jars all with teflon-lined caps and 4-8 oz. capacity. All solid samples should be kept cool at 4 C.

Sampling Procedures

TABLE 6-1 RECOMMENDED SAMPLE COLLECTION AND PRESERVATION

Analysis	Container	Volume (mL)	Preservation	Holding Time
General Inorganic Chemistry continued				
Phosphorus				
Ortho/dissolved	P,G	250	Cool, 4 C	48 hr.
Total	P,G	250	H_2SO_4, pH<2; Cool, 4 C	28 days
Resistivity	P	250	Cool, 4 C	28 days
Silica	P	250	Cool, 4 C	28 days
Sodium Absorption Ratio	P	250	HNO3, pH<2	6 mo.
Solids,				
Filterable	P,G	250	Cool, 4 C	7 days
Non-filterable	P,G	250	Cool, 4 C	7 days
Total	P,G	250	Cool, 4 C	7 days
Volatile	P,G	250	Cool, 4 C	7 days
Settleable	P,G	1000	Cool, 4 C	48 hr.
Sulfate	P,G	250	Cool, 4 C	28 days
Sulfide				
Total	P,G	500	2 ml ZnAcetate+NaOH, pH>9	7 days
Dissolved	P,G	500	NaOH, pH>9	7 days
Tannin & Lignin	G	250		
Titration - pH adjustment	P,G	250	Cool, 4 C	14 days
Turbidity	P,G	250	Cool, 4 C	48 hr.
Trace Metals				
Chromium VI	P,G	500	Cool, 4 C	24 hr.
Mercury	P,G	500	HNO_3, pH<2	28 days
All other metals	P	500	HNO_3, pH<2	6 mo.
Radiochemistry				
Gross Alpha & Beta**	P	1000	HNO_3, pH <2	6 mo.
Total Radium	P	1000	HNO_3, pH <2	6 mo.
Total Uranium	P	1000	HCl, pH <2	6 mo.
Radon*	G	2x250	Cool, 4 C	4 days
Tritium	G	2x250	Cool, 4 C	6 mo.
Strontium 90	P	1000	HCl, pH <2	6 mo.

P = plastic, G = glass
* No headspace over sample
** For non-preserved samples, the holding time is 5 days. For preserved samples, please provide either a non-preserved sample (100 mL) or the electrical conductivity prior to acidification.

Note: All solid samples should be collected in stainless steel sleeves, brass sleeves or in glass jars all with teflon-lined caps and 4-8 oz. capacity. All solid samples should be kept cool at 4 C.

Sampling Procedures

TABLE 6-1 RECOMMENDED SAMPLE COLLECTION AND PRESERVATION

Analysis	Container	Volume (mL)	Preservation	Holding Time
All Bacteriological	P,G	100	0.008% $Na_2S_2O_3$; Cool, 4 C, Sterile	30 hr.

Analysis	Container	Volume (mL)	Preservation	Holding Time
Organic Chemicals				
Drinking Water				
EPA 501*	G, VOA TFE-septa cap	2 x 40	$Na_2S_2O_3$, if chlorinated HCl, pH <2; Cool, 4 C	14 days
EPA 502.2*	G, VOA TFE-septa cap	2 x 40	$Na_2S_2O_3$, if chlorinated HCl pH <2; Cool, 4 C	14 days
EPA 504*	G TFE-septa cap	2 x 40	$Na_2S_2O_3$, if chlorinated Cool, 4 C	28 days
EPA 505**	G TFE-septa cap	2 x 40	$Na_2S_2O_3$, if chlorinated Cool, 4 C	7 days
EPA 507	G, amber TFE-lined cap	1 x 1000	$Na_2S_2O_3$, if chlorinated or HCl pH <2; Cool, 4 C	14 days
EPA 508**	G, amber TFE-lined cap	1 x 1000	$Na_2S_2O_3$, if chlorinated Cool, 4 C	7 days
EPA 510*	G, amber TFE-septa cap	1 x 250	$Na_2S_2O_3$, if chlorinated Cool, 4 C	14 days
EPA 515.1**	G, amber TFE-lined cap	1 x 1000	$Na_2S_2O_3$, if chlorinated Cool, 4 C	7 days
EPA 524.2*	G, VOA TFE-septa cap	2 x 40	$Na_2S_2O_3$, if chlorinated or HCl pH <2; Cool, 4 C	14 days
EPA 525**	G, amber TFE-lined cap	1 x 1000	Cool, 4 C	7 days

* No head space over sample.
** This is the maximum holding time prior to extraction. The extracted sample may be held up to 40 days before analysis.

Sampling Procedures

TABLE 6-1 RECOMMENDED SAMPLE COLLECTION AND PRESERVATION

Analysis	Container	Volume (mL)	Preservation	Holding Time
Organic Chemicals				
Drinking Water				
EPA 531	G, amber	1 x 250	$Na_2S_2O_3$, if chlorinated Monochloroacetic acid buffer	14 days
EPA 547	G, amber	1 x 125	$Na_2S_2O_3$, if chlorinated Cool, 4 C	6 mo.
EPA 548	G, amber	1 x 125	$Na_2S_2O_3$, if chlorinated Cool, 4 C	7 days
EPA 549	G, amber silanized	1 x 1000	$Na_2S_2O_3$, if chlorinated Cool, 4 C	7 days
EPA 550.1	G, amber	1 x 1000	$Na_2S_2O_3$, if chlorinated Cool, 4 C	7 days
EPA 552	G, amber	1 x 1000	NH_4Cl, Cool, 4 C	7 days
EPA 1613A	G, amber	1 x 1000	$Na_2S_2O_3$, if chlorinated Cool, 4 C	7 days
Wastewater and Hazardous Waste				
EPA 601/8010*	G, VOA TFE-septa cap	2 x 40	$Na_2S_2O_3$, if chlorinated HCl, pH <2; Cool, 4 C	14 days
EPA 8011	G, VOA TFE-septa cap	2 x 40	$Na_2S_2O_3$, if chlorinated Cool, 4 C	28 days
EPA 602/8020*	G, VOA TFE-septa cap	2 x 40	$Na_2S_2O_3$, if chlorinated HCl, pH <2; Cool, 4 C	14 days
EPA 603/8030*	G, VOA TFE-septa cap	2 x 40	$Na_2S_2O_3$, if chlorinated Adjust pH to 4-5; Cool, 4 C	14 days
EPA 604/8040**	G, amber TFE-lined cap	1 x 1000	$Na_2S_2O_3$, if chlorinated Cool, 4 C	7 days
EPA 608/8080**	G, amber TFE-lined cap	1 x 1000	$Na_2S_2O_3$, if chlorinated Cool, 4 C	7 days

* No head space over sample.
** This is the maximum holding time prior to extraction. The extracted sample may be held up to 40 days before analysis.

Sampling Procedures

TABLE 6-1 RECOMMENDED SAMPLE COLLECTION AND PRESERVATION

Analysis	Container	Volume (mL)	Preservation	Holding Time
Organic Chemicals				
Wastewater and Hazardous Waste				
EPA 610/8310	G, amber TFE-lined cap	1 x 1000	$Na_2S_2O_3$, if chlorinated Cool, 4 C	14 days
EPA 613**	G, amber TFE-lined cap	1 x 1000	$Na_2S_2O_3$, if chlorinated Cool, 4 C	7 days
EPA 614/8140**	G, amber TFE-lined cap	1 x 1000	Cool, 4 C	7 days
EPA 615/8150**	G, amber TFE-lined cap	1 x 1000	$Na_2S_2O_3$, if chlorinated Cool, 4 C	7 days
EPA 619	G, amber TFE-lined cap	1 x 1000	$Na_2S_2O_3$, if chlorinated Cool, 4 C	14 days
EPA 624/8240*	G, VOA TFE-septa cap	2 x 40	$Na_2S_2O_3$, if chlorinated HCl, pH <2; Cool, 4 C	14 days
EPA 625/8270**	G, amber TFE-lined cap	1 x 1000	$Na_2S_2O_3$, if chlorinated Cool, 4 C	7 days
EPA 632**	G, amber TFE-lined cap	1 x 1000	Cool, 4 C	7 days
EPA 9020* (TOX)***	G, amber TFE-lined cap	1 x 250	H_2SO_4, pH <2 Cool, 4 C	28 days*
EPA 415.1 (TOC)	G, amber TFE-lined cap	1 x 250	HCl or H_2SO_4, pH <2 Cool, 4 C	28 days
EPA 9060	See note	250 g	Cool, 4 C	N/A
Tributyltin	G, amber TFE-lined cap	2 x 1000	Cool, 4 C	28 days

* No head space over sample.
** This is the maximum holding time prior to extraction. The extracted sample may be held up to 40 days before analysis.
*** RCRA holding time is 7 days.
Note: All solid samples should be collected in stainless steel sleeves, brass sleeves or in glass jars all with teflon-lined caps and 4-8 oz. capacity. All solid samples should be kept cool at 4 C.

Sampling Procedures

TABLE 6-1 RECOMMENDED SAMPLE COLLECTION AND PRESERVATION

Analysis	Container	Volume (mL)	Preservation	Holding Time
Organic Chemicals				
Underground Storage Tank Analyses				
EPA 418.1	G, amber TFE-lined cap	1 x 1000	Cool, 4 C	28 days
EPA 8015,8015M*	G, VOA TFE-septa cap	2 x 40	HCl, pH <2 Cool, 4 C	14 days
EPA 601/8010*	G, VOA TFE-septa cap	2 x 40	$Na_2S_2O_3$, if chlorinated HCl, pH <2; Cool, 4 C	14 days
EPA 602/8020*	G, VOA TFE-septa cap	2 x 40	$Na_2S_2O_3$, if chlorinated HCl, pH <2; Cool, 4 C	14 days

Analysis	Container	Volume (mL)	Preservation	Holding Time
Hazardous Waste Characterization				
Corrosivity	P,G	100	Cool, 4 C	7 days
Ignitability	G TFE-lined cap	100	Cool, 4 C	7 days
Reactivity/ Reactions	G TFE-lined cap	100	Cool, 4 C	7 days
Sulfide/Sulfide generation	G TFE-lined cap	100	Cool, 4 C	7 days

* No head space over sample.

Note: All solid samples should be collected in stainless steel sleeves, brass sleeves or in glass jars all with teflon-lined caps and 4-8 oz. capacity. All solid samples should be kept cool at 4 C.

Sampling Procedures

TABLE 6-1 RECOMMENDED SAMPLE COLLECTION AND PRESERVATION

Analysis	Container	Volume (mL)	Preservation	Holding Time
TTLC, STLC, TCLP, and EP Toxicity				
Metals	G TFE-lined cap	500	Cool, 4 C	30 days
Pesticides	G, amber TFE-lined cap	1000	Cool, 4 C	7 days
Herbicides	G, amber TFE-lined cap	1000	Cool, 4 C	7 days
Bioassays				
Chronic	P,G	3x1000	Cool, 4 C	24 hr.
Acute	P,G	2x5 gal	Cool, 4 C	24 hr.

Note: All solid samples should be collected in stainless steel sleeves, brass sleeves or in glass jars all with teflon-lined caps and 4-8 oz. capacity. All solid samples should be kept cool at 4 C.

Sample Custody

7.1 Sample Custody

It is essential to ensure sample integrity from the time of collection through analysis and final disposition. This includes the ability to trace possession and handling of the samples. This is referred to as chain-of-custody and is important in the event of litigation involving the results. Where litigation is not involved, chain-of-custody procedures are useful for routine control of sample flow.

A sample is considered to be under a person's custody if it is in the individual's physical possession, in the individual's sight, secured in a tamper-proof manner by that individual, or is secured in an area restricted to authorized personnel. The following procedures summarize the major aspects of chain-of-custody.

7.1.1 Sample Labels

Use labels to prevent sample misidentification. Gummed paper labels or tags generally are adequate. Include at least the following information: sample number, name of collector, date and time of collection, and place of collection. Affix labels to sample containers before or at the time of sampling. Fill label out with waterproof ink at time of collection.

7.1.2 Custody Seals

Use sample seals to detect unauthorized tampering with samples up to the time of analysis. Plastic seals are normally used. Attach seal in such a way that it is necessary to break the seal to open the sample container. Affix seal to container before sample leaves custody of sampling personnel.

7.1.3 Field Log Book

Record all information pertinent to a field survey or sampling in a bound log book. As a minimum, include the following in the log book: purpose of sampling; location of sampling point; name and address of field contact; producer of material being sampled and address, if different from location; and type of sample. Because sampling situations vary widely, no general rule can be given as to the information to be entered in the log book. It is desirable to record sufficient information between the logbook and chain-of-custody so that one could reconstruct the sampling without reliance on the collector's memory. Protect the log book and keep it in a safe place.

7.1.5 Shipping Samples or Sample Delivery to Laboratory

Prior to shipping samples all documentation must be ready for proper chain of custody. The information necessary for documenting chain of custody is outlined section 7.3. After filling out the proper sample documentation, the samples and documents should be placed in an ice chest with adequate protection. Normally "Blue Ice" is used for keeping samples cool. However, dry ice may be used if approved by Department of Transportation (DOT).

If client provides direct delivery of sample to laboratory, samples should be delivered as soon as practical. Documentation must be ready for proper chain of custody. Again, all information necessary for documenting chain of custody is outlined section 7.3. Accompany sample with chain- of-custody record and a sample analysis request sheet. Deliver sample to sample custodian.

Sample Custody

7.1.6 Receipt and Logging of Sample

In the laboratory, the sample custodian receives the sample and inspects its condition and seal, reconciles label information and seal against the chain-of-custody record, assigns a laboratory number, logs sample in the laboratory computer, and stores it in a secured storage room or cabinet until it is assigned to an analyst.

7.1.7 Assignment of Sample for Analysis

The laboratory supervisor usually assigns the sample for analysis. Once in the laboratory, the supervisor or analyst is responsible for the sample's care and custody.

7.1.8 Safety Considerations

Because sample constituents can be toxic, take adequate precautions during sampling and sample handling. Toxic substances can enter through the skin and, in the case of vapors, through the lungs. Inadvertent ingestion can occur via direct contact with foods or by adsorption of vapors onto foods. Precautions may be limited to wearing gloves or may include coveralls, aprons, or other protective apparel. Always wear eye protection. When toxic vapors might be present, sample only in well-ventilated areas or use a respirator or self-contained breathing apparatus. In a laboratory, open sample containers in a fume hood. Never have food near samples or sampling locations; always wash hands thoroughly before handling food.

If there is any possibility that flammable organic compounds may be present, take adequate precautions. Prohibit smoking near samples, sampling locations, and in the laboratory. Keep sparks, flames, and excessive heat sources away from samples, and sampling locations.

Radioactivity is screened at the time of sample receipt. Consult the radiation safety SOP and Radiation Safety Officer for proper handling of samples.

7.2 Laboratory Sample Control and Tracking

FGL's sample control objectives are achieved through the use of a Laboratory Information Management System (LIMS). LIMS is a computer software system specifically designed by FGL for tracking and handling of the large amount of information required to efficiently manage an analytical chemistry laboratory. The system provides a versatile, easy-to-use vehicle for the laboratory managers and chemists to perform sample tracking and status checks.

7.3 Sample Receiving Policy

Obtain a chain-of-custody record accompanying each sample or group of samples. The chain-of-custody is usually prepared in the field.

Sample Custody

7.3.1 Obtain the following client information and record on chain of custody:

Reporting -
- Address
- Phone Number
- Fax Number
- Person to Contact

Billing -
- Address
- Phone Number
- Fax Number
- P.O. or contract Number
- Person to Contact

7.3.2 Obtain the following project and sample information and record on chain of custody:

Project description
Sample descriptions
Sample type
Sampling date and time
Sample containers, preservatives
EPA Method Numbers or method descriptions
Report form required: ____ State ____ FGL
Determine turn-around-time requirement:
Rush______ Number of Days_____

7.3.3 Inspect the sample for the following:

Have holding times been observed and determine if it is possible for FGL to meet holding times?
Has the correct preservative been used?
Is the sample size adequate?
Is the sample container satisfactory?
Note sample condition :
- Broken/leaking container
- Temperature _____Ambient _____Chilled
- Record Actual Temperature
- Check for headspace when appropriate

Also note on the chain of custody any problems with sample condition, the person notified, time and date notified, and customers response, if any.

Screen all samples for radio chemical hazard using the Geiger counter kept in the sample receiving area. Consult the radiation safety SOP and Radiation Safety Officer for proper handling of samples.

7.3.4 Log the sample information into the LIMS under one of the following divisions:

Inorganic
Organic
Radioactivity
Bacteriology
Agriculture

Sample Custody

7.3.5 Transfer samples and analyses worksheets to the proper refrigerator or lab work distribution area.

7.4 Sample Storage
All samples are retained for a minimum of 30 days except for microbiological samples which are held for a shorter time. A longer storage period can be arranged at the request of the client.

7.5 Sample Disposal
All samples which are considered to be potentially hazardous based upon analytical results or matrix, will be disposed of by lab packing. Extremely hazardous samples may be returned to the client for disposal. All disposal arrangements should be made with a project manager.

7.6 Subcontracted Lab Work
On occasion, laboratory work may need to be subcontracted to certified labs approved by FGL Environmental. Prior to subcontracting the client will be notified. Under no circumstances will work be subcontracted without client requirements being met. When work is subcontracted, it is done so under chain of custody, and the proper records are included with the data package.

Data Reduction, Validation and Reporting

10.4 Data Reporting

Having received approval, the hardcopy report is then generated. Quality assurance reports are also generated at this step. Again, the final reports are reviewed before signing by both the department supervisor and laboratory director. Invoices are also reviewed and initialed by the department supervisor.

10.5 Data Storage

FGL Environmental maintains report files and the supporting raw data for the current and previous year on the premises. Reports and raw data are maintained for a total of ten years in the secured data storage facility.

Data Reduction, Validation, and Reporting

The process of transforming raw analytical data into a finished report involves steps which are generally grouped into the categories of data reduction, data validation, and reporting. It involves mathematical modeling of the standard calibration curves, statistical analysis of the acquired data, calculations to account for preparation steps and dilutions, verification of adherence to quality assurance procedures, and the generation of hardcopy output.

10.1 Data Reduction

At FGL Environmental the analyst has the primary responsibility for reducing raw data. This process consists primarily of converting raw data into final reportable values by comparing individual sample results against those obtained for calibration purposes then accounting for any dilutions or concentration.

For each method, all raw data results are recorded on method specific forms or in a standardized output from each of the various instruments. Details on procedures for data reduction may be found in the laboratory SOP for each method.

10.2 Data Validation

Upon completion of each analytical run, the analyst enters or transfers the data to LIMS. The analytical raw data and LIMS generated QC summary sheets are validated by the laboratory supervisor or a backup peer analyst. They verify that all quality control parameters fall within acceptance limits and also review the analytical data for calculation errors and inconsistencies.

10.3 Data Review Policy

The raw data review includes all documentation associated with the samples, including chromatograms, instrument run logs, digestion logs, and other instrument printouts. Upon approval by the analyst or supervisor, the analytical results for the run are transferred to a results database for compiling with other data for that sample. When all results for a sample have been entered, an on screen report is generated for review and validation by the supervisor. Upon approval by the supervisor sample reports are then released for final hardcopy reporting, which is forwarded to the client.

Data review includes the following:

1) All data packages are reviewed by a second analyst or the supervisor. The QC batch report and analytical run sheets (if applicable) must be signed by the reviewer.
2) All supervisors must review the data released for reporting.
3) Analysis reports are printed and again reviewed by the supervisor and lab director and signed by each upon approval.
4) Quality Control reports are printed and are reviewed and signed by the quality assurance director or officer.

Analytical Procedures

TABLE 9-3 Specific Analytical Solid Waste / Hazardous Waste Methods

Parameter	Method	Description
Trace Metals Analyses continued		
Cobalt (Co)	EPA 6010	ICP
Cobalt (Co)	EPA 6020	ICP/MS
Copper (Cu)	EPA 6010	ICP
Copper (Cu)	EPA 6020	ICP/MS
Gold (Au)	EPA 231.1	Flame Atomic Absorption
Iron (Fe)	EPA 6010	ICP
Lead (Pb)	EPA 7420	Flame Atomic Absorption
Lead (Pb)	EPA 6020	ICP/MS
Lithium (Li)	EPA 7430	Flame Atomic Absorption
Magnesium (Mg)	EPA 6010	ICP
Manganese (Mn)	EPA 6010	ICP
Manganese (Mn)	EPA 6020	ICP/MS
Mercury (Hg)	EPA 7470	Cold Vapor Atomic Absorption
Molybdenum (Mo)	EPA 6010	ICP
Molybdenum (Mo)	EPA 6020	ICP/MS
Nickel (Ni)	EPA 6010	ICP
Nickel (Ni)	EPA 6020	ICP/MS
Phosphorous (P)	EPA 6010	ICP
Potassium (K)	EPA 6010	ICP
Selenium (Se)	EPA 7741	Furnace Atomic Absorption
Selenium (Se)	EPA 6020	ICP/MS
Silver (Ag)	EPA 6010	ICP
Silver (Ag)	EPA 6020	ICP/MS
Sodium (Na)	EPA 6010	ICP
Strontium (Sr)	EPA 6010	ICP
Thallium (Tl)	EPA 7841	Furnace Atomic Absorption
Thallium (Tl)	EPA 6020	ICP/MS
Tin (Sn)	EPA 6010	ICP
Titanium (Ti)	EPA 6010	ICP
Uranium (U)	EPA 6010	ICP
Vanadium (V)	EPA 6010	ICP
Zinc (Zn)	EPA 6010	ICP
Zinc (Zn)	EPA 6020	ICP/MS
Radio Chemical Analyses		
Gross Alpha	EPA 900.0	Proportional counter
Gross Beta	EPA 900.0	Proportional counter
Gross Alpha & Beta	EPA 900.0	Proportional counter
Gamma Emmitters	EPA 901.1	HPGe, gamma spectroscope
Total Radium*	EPA 900.1	Isolation, Proportional Counter
Radium 226	EPA 903.1	Radon bubbler, Lucas cell scintillation
Radium 228	EPA 904.0	Isolation, Proportional Counter
Uranium	EPA 908.0	Isolation, proportional counter
Tritium	EPA 906.0	Distillation, liquid scintillation
Radon	EPA 913.0	Liquid scintillation

* Can be reported as Radium 226 if less than 3 pCi/liter.

Analytical Procedures

TABLE 9-3 Specific Analytical Solid Waste / Hazardous Waste Methods

Parameter	Method	Description
General Inorganic Analyses continued		
pH	EPA 9045	ISE
Phosphorous		
Phosphate (PO4)	EPA 9056	IC
Total (P)	See Trace Metals	
Sulfate (SO4)	EPA 9056	IC
Sulfide (H2S)	EPA 376.2	Colorimetric
Hazardous Waste Characterization Analyses		
Corrosivity (pH)		
Aqueous sample	EPA 9040	ISE
Nonaqueous sample	EPA 9045	ISE
Ignitability		
Aqueous (Flashpoint)	EPA 1010	Flashpoint
Nonaqueous (Flammability)	EPA 1020	Flashpoint
Reactivity	SW-846 Ch 8	Observations
Reaction with water		
Reaction with dilute acid		
Reaction with dilute base		
Reaction with oxidizing agent		
Reaction with reducing agent		
Generation	SW-846 Ch 7	Screens
Sulfide		
Cyanide		
Trace Metals		
Sample Preparation - TTLC	EPA 3050	Digestion
Sample Preparation - STLC	Title 22	Extraction
Sample Preparation - EP TOX	EPA 1310	Extraction
Sample Preparation - TCLP	EPA 1311	Extraction
Aluminum (Al)	EPA 6010	ICP
Aluminum (Al)	EPA 6020	ICP/MS
Antimony (Sb)	EPA 7041	Furnace Atomic Absorption
Antimony (Sb)	EPA 6020	ICP/MS
Arsenic (As)	EPA 7060	Furnace Atomic Absorption
Arsenic (As)	EPA 6020	ICP/MS
Barium (Ba)	EPA 6010	ICP
Barium (Ba)	EPA 6020	ICP/MS
Beryllium (Be)	EPA 6010	ICP
Beryllium (Be)	EPA 6020	ICP/MS
Boron (B)	EPA 6010	ICP
Boron (B)	EPA 6020	ICP/MS
Cadmium (Cd)	EPA 6010	ICP
Cadmium (Cd)	EPA 6020	ICP/MS
Calcium (Ca)	EPA 6010	ICP
Chromium (Cr)	EPA 6010	ICP
Chromium (Cr)	EPA 6010	ICP/MS
Chromium VI (Cr+6)	EPA 7196	Colorimetric

Analytical Procedures

TABLE 9-3 Specific Analytical Solid Waste / Hazardous Waste Methods

Parameter	Method	Description
Organic Chemical Analyses		
Sample Preparation - STLC	Title 22	Extraction
Sample Preparation - EP TOX	EPA 1310	Extraction
Sample Preparation - TCLP	EPA 1311	Extraction
Sample Preparation	EPA 3510	Liquid-Liquid extraction
Sample Preparation	EPA 3520	Continous Liquid- Liquid Extraction
Sample Preparation	EPA 3540	Soxhlet Extraction
Sample Preparation	EPA 3550	Sonication Extraction
Sample Preparation	EPA 3580	Solvent Dilution
Purgeable Halocarbons	EPA 8010	GC/PID/Hall, purge & trap
EDB and DBCP	EPA 8011	GC/ECD, micro extraction
Non-Halogenated Volatile Organics	EPA 8015	GC/FID, purge & trap
Total Petroleum Hydrocarbons Purgeable	EPA 8015M	GC/FID, purge & trap
Total Petroleum Hydrocarbons Extractable	EPA 8015M	GC/FID, micro extraction
Aromatic Volatile Organics	EPA 8020	GC/FID, purge & trap
Phenols	EPA 8040	GC/CED, soxhlet or sonication
Chlorinated Pesticides & PCB's	EPA 8080	GC/ECD, soxhlet or sonication
Polynuclear Aromatic Hydrocarbons	EPA 8100	GC/PID, soxhlet or sonication
Organophosphorus Pesticides	EPA 8141	GC/FPD, soxhlet or sonication
Chlorinated Phenoxy Herbicides	EPA 8150	GC/ECD, soxhlet or sonication
Volatile Organics	EPA 8240	GC/MS, purge & trap
Semi-volatile Organics	EPA 8270	GC/MS, soxhlet or sonication
Polynuclear Aromatic Hydrocarbons	EPA 8310	HPLC/UV, liquid- liquid
Carbamates	EPA 632	HPLC/UV, liquid- liquid
Total Organic Carbon (TOC)	EPA 9060	IR, combustion
Total Organic Halogens (TOX)	EPA 9020	Coulometric, Pyrolysis
Total Recov. Pet. Hydrocarbons	EPA 418.1	IR, liquid-liquid
General Inorganic Analyses		
Chloride (Cl)	EPA 9056	IC
Electrical Conductivity	EPA 120.1	Conductivity bridge
Cyanide, total (CN)	EPA 335.2	Distillation- Colorimetric
Fluoride (F)	EPA 340.1	Distillation-ISE
Moisture	ASA/UL	Gravimetric
Nitrogen		
Ammonia (NH3-N)	EPA 350.1	Colorimetric
Nitrate (NO3-N)	EPA 9056	IC
Nitrite (NO2-N)	EPA 9056	IC
Organic (TKN-NH3-N)	N/A	Calcul ation
Total (TKN+NO3-N+NO2-N)	N/A	Calcul ation
Total Kjeldahl	EPA 351.1	Colorimetric
Oil and grease		
Soxhlet	EPA 413.1M	Gravimetric

Analytical Procedures

TABLE 9-2 Specific Analytical Wastewater / Hazardous Waste Liquid Methods

Parameter	Method	Description
Radio Chemical Analyses		
Gross Alpha	EPA 900.0	Proportional counter
Gross Beta	EPA 900.0	Proportional counter
Gross Alpha & Beta	EPA 900.0	Proportional counter
Gamma Emmitters	EPA 901.1	HPGe, gamma spectroscope
Total Radium*	EPA 900.1	Isolation, Proportional Counter
Radium 226	EPA 903.1	Radon bubbler, Lucas cell scintillation
Radium 228	EPA 904.0	Isolation, Proportional Counter
Uranium	EPA 908.0	Isolation, proportional counter
Tritium	EPA 906.0	Distillation, liquid scintillation
Radon	EPA 913.0	Liquid scintillation
Bacteriological Analyses		
Total Coliform	SM9221E	Fermentation, MPN, 15 tube
Total & Fecal Coliform	SM9221E	Fermentation, MPN, 15 tube
Standard Plate Count	SM9215B	Incubation, visual count

* Can be reported as Radium 226 if less than 3 pCi/liter.

Analytical Procedures

TABLE 9-2 Specific Analytical Wastewater / Hazardous Waste Liquid Methods

Parameter	Method	Description
Trace Metals Analyses continued		
Boron (B)	EPA 200.7	ICP
Boron (B)	EPA 200.8	ICP/MS
Cadmium (Cd)	EPA 200.9	Furnace Atomic Absorption
Cadmium (Cd)	EPA 200.8	ICP/MS
Calcium (Ca)	EPA 200.7	ICP
Chromium (Cr)	EPA 200.9	Furnace Atomic Absorption
Chromium (Cr)	EPA 200.8	ICP/MS
Chromium VI (Cr+6)	EPA 7196	Colorimetric
Cobalt (Co)	EPA 200.7	ICP
Cobalt (Co)	EPA 200.8	ICP/MS
Copper (Cu)	EPA 200.7	ICP
Copper (Cu)	EPA 200.8	ICP/MS
Gold (Au)	EPA 231.1	Flame Atomic Absorption
Iron (Fe)	EPA 200.7	ICP
Lead (Pb)	EPA 200.9	Furnace Atomic Absorption
Lead (Pb)	EPA 200.8	ICP/MS
Lithium (Li)	SM 3500LiB	Flame Atomic Absorption
Magnesium (Mg)	EPA 200.7	ICP
Manganese (Mn)	EPA 200.7	ICP
Manganese (Mn)	EPA 200.8	ICP/MS
Mercury (Hg)	EPA 245.1	Cold Vapor Atomic Absorption
Mercury (Hg)	EPA 245.2	Cold Vapor Atomic Absorption
Molybdenum (Mo)	EPA 200.7	ICP
Molybdenum (Mo)	EPA 200.8	ICP/MS
Nickel (Ni)	EPA 200.7	ICP
Nickel (Ni)	EPA 200.8	ICP/MS
Potassium (K)	EPA 200.7	ICP
Selenium (Se)	EPA 200.9	Furnace Atomic Absorption
Selenium (Se)	EPA 200.8	ICP/MS
Silica (SiO2)	EPA 200.7	ICP
Silver (Ag)	EPA 200.9	Furnace Atomic Absorption
Silver (Ag)	EPA 200.8	ICP/MS
Sodium (Na)	EPA 200.7	ICP
Strontium (Sr)	EPA 200.7	ICP
Thallium (Tl)	EPA 200.9	Furnace Atomic Absorption
Thallium (Tl)	EPA 200.8	ICP/MS
Tin (Sn)	EPA 200.9	Furn ace Atomic Absorption
Titanium (Ti)	EPA 200.7	ICP
Uranium (U)	EPA 200.7	I CP
Vanadium (V)	EPA 200.7	ICP
Zinc (Zn)	EPA 200.7	ICP
Zinc (Zn)	EPA 200.7	ICP/MS

Analytical Procedures

TABLE 9-2 Specific Analytical Wastewater / Hazardous Waste Liquid Methods

Parameter	Method	Description
General Inorganic Analyses continued		
Nitrogen		
Ammonia (NH3-N)	EPA 350.1	Colorimetric
Nitrate (NO3-N)	EPA 300.0	IC
Nitrite (NO2-N)	EPA 300.0	IC
Organic (TKN-NH3-N)	Calculation	
Total (TKN+NO3-N+NO2-N)	Calculation	
Total Kjeldahl	EPA 351.2	Colorimetric
Odor	EPA 140.1	Observation
Oil and Grease	EPA 413.1	Gravimetric
Oxygen, Dissolved (DO)	EPA 360.1	ISE
pH	EPA 150.1	ISE
Phenols	EPA 420.1	Colorimetric
Phosphorous		
Phosphate (PO4-P)	EPA 300.0	IC
Phosphate-dissolved (PO4-P)	EPA 300.0	IC
Total (P)	EPA 365.2	Colorimetric
Total-dissolved (P)	EPA 365.2	Colorimetric
Resistivity	N/A	Calculation
Sodium Percent	N/A	Calculation
Sodium Absorption Ratio (SAR)	EPA 200.7	ICP
Solids/Residue		
Filterable (TDS)	EPA 160.1	Gravimetric
Non-filterable (TSS)	EPA 160.2	Gravimetric
Total	EPA 160.3	Gravimetric
Volatile	EPA 160.4	Gravimetric
Settleable	EPA 160.5	Gravimetric
Sulfate (SO4)	EPA 300.0	IC
Sulfide (H2S)		
Total	EPA 376.2	Methylene Blue
Dissolved	EPA 376.2	Methylene Blue
Sulfite (SO2)	EPA 377.1	Titrimetric
Tannin & Lignin	SM 513	Colorimetric
Titration - pH adjustment	N/A	Titration
Turbidity	EPA 180.1	Nephelometric
Trace Metals Analyses		
Sample Preparation	EPA 3015	Digestion
Aluminum (Al)	EPA 200.9	Furnace Atomic Absorption
Aluminum (Al)	EPA 200.8	ICP/MS
Antimony (Sb)	EPA 200.9	Furnace Atomic Absorption
Antimony (Sb)	EPA 200.8	ICP/MS
Arsenic (As)	EPA 200.9	Furnace Atomic Absorption
Arsenic (As)	EPA 200.8	ICP/MS
Barium (Ba)	EPA 200.7	ICP
Barium (Ba)	EPA 200.8	ICP/MS
Beryllium (Be)	EPA 200.7	ICP
Beryllium (Be)	EPA 200.8	ICP/MS

Analytical Procedures

TABLE 9-2 Specific Analytical Wastewater / Hazardous Waste Liquid Methods

Parameter	Method	Description
Organic Chemical Analyses		
Sample Preparation	EPA 3510	Liquid-Liquid extraction
Sample Preparation	EPA 3520	Continous Liquid- Liquid Extraction
Sample Preparation	EPA 3580	Solvent Dilution
Purgeable Halocarbons	EPA 601/8010	GC/PID/Hall, purge & trap
EDB and DBCP	EPA 8011	GC/ECD, micro extraction
Non-Halogenated Volatile Organics	EPA 8015	GC/FID, purge & trap
Total Petroleum Hydrocarbons Purgeable	EPA 8015M	GC/FID, purge & trap
Non-Halogenated Volatile Organics Extractable	EPA 8015M	GC/FID, micro extraction
Aromatic Volatile Organics	EPA 602/8020	GC/FID, purge & trap
Phenols	EPA 604/8040	GC/ECD, liquid- liquid
Chlorinated Pesticides & PCB's	EPA 608/8080	GC/ECD, liquid- liquid
Polynuclear Aromatic Hydrocarbons	EPA 610/8310	HPLC/UV, liquid- liquid
Organophosphorus Pesticides	EPA 614/8140	GC/FPD, liquid- liquid
Chlorinated Herbicides	EPA 615/8150	GC/ECD, liquid- liquid
Volatile Organics	EPA 624/8240	GC/MS, purge & trap
Semi-volatile Organics	EPA 625/8270	GC/MS, liquid- liquid
Carbamates	EPA 632	HPLC/UV, liquid- liquid
Total Organic Carbon (TOC)	EPA415.1/9060	IR, combustion
Total Organic Halogens (TOX)	EPA 9020	Coulometric, Pyrolysis
Total Recov. Pet. Hydrocarbons	EPA 418.1	IR, liquid-liquid
General Inorganic Analyses		
Acidity	EPA 305.1	Titration
Aggressive Index	N/A	Calculation
Alkalinity (CaCO3)	EPA 310.1	Titration
Bicarbonate (HCO3)	EPA 310.1	Colorimetric
Biochemical Oxygen Demand (BOD5)	EPA 405.1	ISE
Bromide (Br)	EPA 300.0	IC
Carbonate (CO3)	EPA 310.1	Titration
Carbon Dioxide (CO2)	SM 4500CO2	Titration
Chemical Oxygen Demand (COD)	EPA 410.2	Colorimetric
Chloride (Cl)	EPA 300.0	IC
Chlorine Residual (Cl2)	EPA 330.2	Titration
Chlorine Residual (Cl2)	EPA 330.5	Colorimetric
Chlorine Demand	SM 409A	Titration
Color	EPA 110.3	Visual
Cyanide, Total (CN)	EPA 335.2	Colorimetric
Electrical Conductivity (EC)	EPA 120.1	Conductivity Bridge
Fluoride (F)	EPA 340.2	ISE
Hardness, total (as CaCO3)	EPA 130.2	Titration
Hydroxide (OH)	EPA 310.1	Titration
Langelier Index (corrosivity)	SM 2330B	Calculation
MBAS	EPA 425.1	Colorimetric

Analytical Procedures

TABLE 9-1 Specific Analytical Drinking Water Methods

Parameter	Method	Description
Radiochemical Analyses		
Gross Alpha	EPA 900.0	Proportional Counter
Gross Beta	EPA 900.0	Proportional Counter
Gross Alpha & Beta	EPA 900.0	Proportional Counter
Gamma Emmitters	EPA 901.1	HPGe, gamma spectroscope
Total Radium*	EPA 900.1	Isolation, Proportional Counter
Radium 226	EPA 903.1	Radon bubbler, Lucas cell scintillation
Radium 228	EPA 904.0	Isolation, Proportional Counter
Uranium	EPA 908.0	Isolation, Proportional Counter
Tritium	EPA 906.0	Distillation, Liquid Scintillation
Radon	EPA 913.0	Liquid Scintillation
Bacteriological Analyses		
Total & Fecal Coliform	SM9221E	Fermentation, MPN, 10 tube
Total Coliform-Colilert	SM9221D	Presence-Absence
Standard Plate Count	SM9215B	Incubation, visual count

* Can be reported as Radium 226 if less than 3 pCi/liter.

Analytical Procedures

TABLE 9-1 Specific Analytical Drinking Water Methods

Parameter	Method	Description
Trace Metals Analyses continued		
Beryllium (Be)	EPA 200.8	ICP/MS
Boron (B)	EPA 200.7	ICP
Boron (B)	EPA 200.8	ICP/MS
Cadmium (Cd)	EPA 200.9	Furnace Atomic Absorption
Cadmium (Cd)	EPA 200.8	ICP/MS
Calcium (Ca)	EPA 200.7	ICP
Chromium (Cr)	EPA 200.9	Furnace Atomic Absorption
Chromium (Cr)	EPA 200.8	ICP/MS
Chromium VI (Cr+6)	EPA 7196	Colorimetric
Cobalt (Co)	EPA 200.7	ICP
Cobalt (Co)	EPA 200.8	ICP/MS
Copper (Cu)	EPA 200.7	ICP
Copper (Cu)	EPA 200.8	ICP/MS
Iron (Fe)	EPA 200.7	ICP
Lead (Pb)	EPA 200.9	Furnace Atomic Absorption
Lead (Pb)	EPA 200.8	ICP/MS
Lithium (Li)	SM 3500LiB	Flame Atomic Absorption
Magnesium (Mg)	EPA 200.7	ICP
Manganese (Mn)	EPA 200.7	ICP
Manganese (Mn)	EPA 200.8	ICP/MS
Mercury (Hg)	EPA 245.1	Cold Vapor Atomic Absorption
Mercury (Hg)	EPA 245.2	Cold Vapor Atomic Absorption
Molybdenum (Mo)	EPA 200.7	ICP
Molybdenum (Mo)	EPA 200.8	ICP/MS
Nickel (Ni)	EPA 200.7	ICP
Nickel (Ni)	EPA 200.8	ICP/MS
Potassium (K)	EPA 200.7	ICP
Selenium (Se)	EPA 200.9	Furnace Atomic Absorption
Selenium (Se)	EPA 200.8	ICP/MS
Silica (SiO2)	EPA 200.7	ICP
Silver (Ag)	EPA 200.9	Furnace Atomic Absorption
Silver (Ag)	EPA 200.8	ICP/MS
Sodium (Na)	EPA 200.7	ICP
Thallium (Tl)	EPA 200.9	Furnace Atomic Absorption
Thallium (Tl)	EPA 200.8	ICP/MS
Tin (Sn)	EPA 200.9	Furnace Atomic Absorption
Vanadium (V)	EPA 200.7	ICP
Vanadium (V)	EPA 200.8	ICP/MS
Zinc (Zn)	EPA 200.7	ICP
Zinc (Zn)	EPA 200.7	ICP/MS

Analytical Procedures

TABLE 9-1 Specific Analytical Drinking Water Methods

Parameter	Method	Description
General Inorganic Analyses continued		
Nitrogen		
Ammonia (NH3-N)	EPA 350.1	Colorimetric
Nitrate (NO3-N)	EPA 300.0	IC
Nitrite (NO2-N)	EPA 300.0	IC
Nitrate (NO3-N)	EPA 353.2	Colorimetric
Nitrite (NO2-N)	EPA 353.2	Colorimetric
Organic (TKN-NH3-N)	N/A	Calculation
Total (TKN+NO3-N+NO2-N)	N/A	Calculation
Total Kjeldahl	EPA 351.2	Colorimetric
Odor	EPA 140.1	Observation
Oil and Grease	EPA 413.1	Gravimetric
Oxygen, Dissolved (DO)	EPA 360.1	ISE
pH	EPA 150.1	ISE
Phenols	EPA 420.1	Colorimetric
Phosphorous		
Phosphate (PO4-P)	EPA 300.0	IC
Phosphate-dissolved (PO4-P)	EPA 300.0	IC
Total (P)	EPA 365.2	Colorimetric
Total-dissolved (P)	EPA 365.2	Colorimetric
Resistivity	N/A	Calculation
Sodium Percent	N/A	Calculation
Sodium Absorption Ratio (SAR)	EPA 200.7	ICP
Solids/Residue		
Filterable (TDS)	EPA 160.1	Gravimetric
Non-filterable (TSS)	EPA 160.2	Gravimetric
Total	EPA 160.3	Gravimetric
Volatile	EPA 160.4	Gravimetric
Settleable	EPA 160.5	Gravimetric
Sulfate (SO4)	EPA 300.0	IC
Sulfide (H2S)		
Total	EPA 376.2	Methylene Blue
Dissolved	EPA 376.2	Methylene Blue
Sulfite (SO2)	EPA 377.1	Titrimetric
Tannin & Lignin	SM 5500B	Colorimetric
Titration - pH adjustment	N/A	Titration
Turbidity	EPA 180.1	Nephelometric
Trace Metals Analyses		
Aluminum (Al)	EPA 200.9	Furnace Atomic Absorption
Aluminum (Al)	EPA 200.8	ICP/MS
Antimony (Sb)	EPA 200.9	Furnace Atomic Absorption
Antimony (Sb)	EPA 200.8	ICP/MS
Arsenic (As)	EPA 200.9	Furnace Atomic Absorption
Arsenic (As)	EPA 200.8	ICP/MS
Barium (Ba)	EPA 200.7	ICP
Barium (Ba)	EPA 200.8	ICP/MS
Beryllium (Be)	EPA 200.7	ICP

Analytical Procedures

TABLE 9-1 Specific Analytical Drinking Water Methods

Parameter	Method	Description
Organic Chemicals		
Trihalomethanes	EPA 501.2	GC/ECD, micro extraction
Volatile Organics	EPA 502.2	GC/PID/Hall, purge & trap
Dibromochloropropane (DBCP) and Ethylene dibromide (EDB)	EPA 504	GC/ECD, micro extraction
Chlorinated Pesticides	EPA 505	GC/ECD, micro extraction
Nitrogen/phosphorus Pesticides	EPA 507	GC/NPD, liquid-liquid
Chlorothalonil	EPA 508	GC/ECD, liquid-liquid
PCB's as Decachlorobiphenyl	EPA 508A	GC/ECD, liquid-liquid
Trihalomethane Form. Potential	EPA 510	GC/ECD, micro extraction
Herbicides	EPA 515.1	GC/ECD, liquid-liquid
Volatile Organics	EPA 524.2	GC/MS, purge & trap
Diethylhexylphthalate	EPA 525	GC/MS, SPE
Carbamates	EPA 531	HPLC, post column derivatization
Glyphosate (Roundup)	EPA 547	HPLC, post column derivatization
Endothall	EPA 548	HPLC, post column derivatization
Paraquat and Diquat	EPA 549	HPLC, post column derivatization
Polynuclear Aromatic Hydrocarbons	EPA 550.1	HPLC, post column derivatization
Haloacetic Acids	EPA 552.1	HPLC, post column derivatization, SPE
General Inorganic Analyses		
Acidity	EPA 305.1	Titration
Aggressive Index	N/A	Calculation
Alkalinity (CaCO3)	EPA 310.1	Titration
Bicarbonate (HCO3)	EPA 310.1	Titration
Biochemical Oxygen Demand (BOD5)	EPA 405.1	ISE
Bromide (Br)	EPA 300.0	IC
Carbon Dioxide (CO2)	SM 4500CO2	Titration
Carbonate (CO3)	EPA 310.1	Titration
Chemical Oxygen Demand (COD)	EPA 410.2	Colorimetric
Chloride (Cl)	EPA 300.0	IC
Chlorine Residual (Cl2)	EPA 330.2	Titration
Chlorine Residual (Cl2)	EPA 330.5	Colorimetric
Chlorine Demand	SM 409A	Colorimetric
Color	EPA 110.3	Observation
Cyanide, Total (CN)	EPA 335.2	Colorimetric
Electrical Conductivity (EC)	EPA 120.1	Conductivity Bridge
Fluoride (F)	EPA 340.2	ISE
Hardness, total (as CaCO3)	EPA 130.2	Titration
Hardness, total (as CaCO3)	SM 2340B	Calculation
Hydroxide (OH)	EPA 310.1	Titration
Langelier Index (corrosivity)	SM 2330B	Calculation
MBAS	EPA 425.1	Colorimetric

Analytical Procedures

9.1 Method Sources

FGL uses EPA or standard methods for virtually all analyses. The following method manuals are used as references:

Drinking Water Methods -

1) "Methods for Chemical Analysis in Waters and Waste," (MCAWW) EPA-600/4-79-020
2) "Standard Methods for the Analysis of Water and Wastewater," 17th Edition, 1990.
3) "Methods for the Determination of Organic Compounds in Drinking Water," EPA Method Book, EPA-600/4-88-039, December 1988.
4) "Methods for the Determination of Organic Compounds in Drinking Water-Supplement I," EPA Method Book, EPA-600/4- 90-020, July 1990.
5) "Methods for the Determination of Organic Compounds in Drinking Water-Supplement II," EPA Method Book, EPA-600/4- 90-020, July 1990.
6) "Eastern Environmental Radiation Facility Radiochemistry Procedures Manual," EPA Method Book, EPA 520/5-84-006, August 1984.
7) "Environmental Measurements Laboratory Procedures," HASL-300, 27th Edition, February 1992.

Wastewater Methods -

1) "Methods for Chemical Analysis in Waters and Waste," (MCAWW) EPA-600/4-79-020
2) "Standard Methods for the Analysis of Water and Wastewater," 17th Edition, 1990.
3) "Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater," EPA Method Book, EPA 600/4-82-057, July 1982.
4) "Eastern Environmental Radiation Facility Radiochemistry Procedures Manual," EPA Method Book, EPA 520/5-84-006, August 1984.
5) "Environmental Measurements Laboratory Procedures," HASL-300, 27th Edition, February 1992.

Solid Waste / Hazardous Waste Methods -

1) "Methods for Evaluating Solid Waste," EPA Method Book, SW- 846, revision 3, and proposed revisions.
2) "Eastern Environmental Radiation Facility Radiochemistry Procedures Manual," EPA Method Book, EPA 520/5-84-006, August 1984.
3) "Environmental Measurements Laboratory Procedures," HASL-300, 27th Edition, February 1992.

Calibration Procedures and Frequency

8.3.12 Calibration Frequency

8.3.12.1 Inorganics

For trace metals analyses calibrations are performed initially for each analytical run. After initial calibration verification (ICV) recalibration or continuing calibration checks are used every ten analyses. For wet chem analyses, a new curve is generated every six months. To verify daily calibration of wet chem methods a continuing calibration verifications (CCV) is used. Exceptions may exist for method specific SOPs.

8.3.12.2 Organics

GC and GC/MS methods are calibrated initially for all analytes. For each additional day of operation, a calibration check standard is analyzed and evaluated. If the calibration is deemed valid the analysis may be performed. Otherwise, the system is recalibrated. Exceptions may exist for method specific SOPs.

8.3.12.3 Radiochemistry

All methods utilize recalibration or continuing calibration verifications every ten samples. EPA check samples are performed quarterly. DOE check sample are performed on a semiannual basis. The results must be acceptable to maintain certification. Exceptions may exist for certain method specific SOP's

8.3.12.3.1 Gas Proportional Counters

Gas proportional counters are calibrated for each matrix and sample size. For most liquid samples an efficiency vs. mg chart for each instrument is fit to a polynomial equation, which is stored in the computer for automated calculation.

8.3.12.3.2 Liquid Scintillation

Liquid Scintillation analyzers are calibrate for each matrix and sample size. Standards are initially run in duplicate with calibration verifications performed on each analytical run.

8.3.12.3.3 Gamma Spectroscopy

Gamma spectroscopy analyses are calibrated for both energy and efficiency. The calibration range is from 20 keV to 1350 keV with a minimum of 7 strong peaks per calibration for each geometry and matrix.

Calibration Procedures and Frequency

8.3.11 Organic Mass Spectrometry Tuning Criteria

In addition to the above calibration criteria, GC/MS methods require mass spectrometer tuning. The acceptance criteria for volatile organics using bromofluorobenzene (BFB) are listed in table 8-1. The acceptance criteria for semivolatile organics using decafluorotriphenylphosphene (DFTPP) are listed in table 8-2.

Table 8-1

GC/MS Volatile Organic Key Ion Abundance Tuning Criteria, using BFB

Mass	Ion Abundance Criteria
50	15 to 40% of mass 95
75	30 to 60% of mass 95
95	base peak, 100% relative abundance
96	5 to 9% of mass 95
173	less than 2% of mass 174
174	greater than 50% of mass 95
175	5 to 9% of mass 174
176	greater than 95% but less than 101% of mass 174
177	5 to 9% of mass 176

Table 8-2

GC/MS Semivolatile Organic Key Ion Abundance Tuning Criteria, using DFTPP

Mass	Ion Abundance Criteria
51	30 to 60% of mass 198
68	less than 2% of mass 69
70	less than 2% of mass 69
127	40 to 60% of mass 198
197	less than 1% of mass 198
198	base peak, 100% relative abundance
199	5 to 9% of mass 198
275	10 to 30% of mass 198
365	greater than 1% of mass 198
441	present but less than mass 443
442	greater than 40% of mass 198
443	17 to 23% of mass 442

Calibration Procedures and Frequency

8.3.6 Selection of Calibration Levels
Two standards should be included per order of magnitude of concentration of the calibration curve. For example 0.1, 1.0, 10.0 has 2 standards per order magnitude (0.1 and 1.0; 1.0 and 10.0). In cases where instrumentation spans several orders of magnitude, the SOP for that method may not require this policy.

The lowest calibration level should be within a factor of 10 of the detection limit for reporting (DLR) for each target compound unless otherwise specified in the SOP.

8.3.7 Calibration Analysis Sequence
The calibration must progress from the analysis of the lowest to highest standard unless the instrumentation does not permit it. A blank must be analyzed after the highest calibration standard.

If the analysis requires an initial high standard to set the gain, a blank must be run before starting with the low calibration standard unless the instrumentation does not permit it.

8.3.8 Calibration Acceptance Criteria
In general, for inorganics, the calculated value for standards must be within 10% of the expected value. However, the value determined by the calibration curve for the lowest standard must be within +/- 50% of the true value and if the calibration is linear through the origin (at less than +/- 1/2 the detection limit). For organics, if a linear regression is used, a single average response factor may be used. The percent relative standard deviation for the individual standard response factors must be less than the maximum value listed for the method in the SOP.

8.3.9 Calibration Check Compounds (CCC) and Initial Calibration Verifications (ICV's)
The CCC or ICV is used to check the validity of the initial calibration. This standard is composed of some or all of the same analytes used for calibration but from a different source than the calibration standard. The standard should be at a concentration near the midpoint of the curve. In many cases FGL uses a Laboratory Control Sample (LCS) as an ICV. In this case the LCS verifies both the calibration and sample preparation. FGL uses control charts for LCS's and acceptance ranges for many analytes have been statistically derived. Please see table 5-1 for acceptance limits. If calculated acceptance criteria are not listed, the general acceptance range is +/-25% of the true value for organics and +/-10% for inorganics.

8.3.10 Continuing Calibration Verifications (CCV)
The CCV is used to verify continuing calibration validity without having to completely restandardize the instrument. Refer to specific EPA methods or SOPs to determine whether this is required. The continuing calibration standard should be near the mid-point of the calibration curve. If calculated acceptance criteria are not listed, the general acceptance range is +/-25% of the true value for organics and +/-10% for inorganics.

Calibration Procedures and Frequency

8.3.3 Selection of Quantitation Technique (Organics)

For organic analysis, a decision must be made during the validation process (and detailed in the SOP) as to whether an internal or external quantitation technique will be routinely employed.

The internal standard method of quantitation cannot be employed unless all of the following conditions are met:

(1) The internal standard must be added post-extraction.
(2) The internal standard must be added quantitatively.
(3) Any analyte that is a target analyte in the method of interest may not be selected for use as an internal standard.
(4) The concentration of the internal standard(s) must not exceed the calibration range of the method target analyte. In cases where the target analytes are associated with more than one calibration range (i.e. analytes "1-4" are calibrated from 1 to 10 ppb, while analyte "5" is calibrated from 10 to 100 ppb, all target analytes should be prepared at a level between the highest and lowest calibration standard (e.g. approximately 50 ppb in the example given).

The use of internal standard quantitation is of greatest benefit in those methods subject to injection variability, and thus, variability in the absolute mass injected onto the column(s) employed. The drawback to this technique, for GC methods, is that any compound which exhibits a similar retention time as the compound used for the internal standard will be identified as the internal standard, leading to erronous quantitation. For this reason, the internal standard technique is most useful for GC/MS where deuterated analytes not naturally occuring can be detected and quantified.

8.3.4 Selection of Calibration Method

As part of the validation process, the specific calibration range and calibration method must be determined and documented in the SOP. Once determined in this manner, the same protocols must be followed each time the method is employed. This will ensure that data reduction is not performed differently on separate data sets by different analysts. The calibration acceptance criteria are listed in section 8.3.8. A least squares (linear) regression is initially tried as a calibration method. For organics, if a linear regression is used, a single average response factor may be used. For inorganics, if the acceptance criteria cannot be met using a linear regression, then a second order polynomial can be used to fit the data, with the same acceptance criteria being applied. In the event that neither a simple linear regression nor a second order polynomial fit result in an equation which meets the calibration acceptance criteria, then the calibration range must be reduced.

8.3.5 Minimum Number of Calibration Levels

Most calibrations include a minimum of three or five initial calibration standards plus a blank. Specific SOPs may have other requirements.

Calibration Procedures and Frequency

The production of analytical data of known, defensible and documented quality requires adherence to standardized procedures which cover all aspects of laboratory operation. The following sections provide details of the standardized procedures relating to instrumentation calibration.

8.1 Instrument Calibration

Prior to use, every instrument must be calibrated according to the procedure found in the method specific Standard Operating Procedure (SOP). A list of all laboratory equipment may be found in section 17. Tables 8-1 and 8-2 list the organic mass spectrometer calibration ion abundance criteria which must be met.

The analytical balances are certified once a year by a certified specialist. All balances are labelled as certified. All balances are checked monthly using NIST traceable S weights which are calibrated annually.

All refrigerator, oven, and incubator temperatures are monitored daily, and all oven and incubator thermometers are checked for accuracy on a quarterly basis.

8.2 Calibration Standards

All chemicals used by FGL Environmental are ACS reagent grade, or better. Wherever possible, standards are from sources that are traceable to the National Institude of Standards and Technology. A log book is maintained for all working standards. Each log contains the standard ID or code, date of working standard preparation, analyst initials who prepared the standard, the manufacturers lot number, stock solution expiration date, stock analyte concentration(s), analyte concentration(s), and initial and final volumes used in dilutions. The working standard container is also labeled with ID or code, date of standard preparation, analyst initials who prepared the standard, expiration date, analytes and analyte concentration.

8.3 Calibration Policy

8.3.1 Applicability

This policy is designed to be a guideline to ensure that all data are treated alike, and thus ensuring that data generated on any particular day of analysis are representative of the norm. However, the policies are not intended to be absolute criteria for the acceptance or rejection of any analytical data.

In cases where the acceptance criteria outlined in policy or SOPs cannot be achieved then the analyst uses a non- conformance report form to document the difficulty. More than one continuing difficulty will result in a Corrective Action Report (CAR, see section 15). These are on record and will be included in a project data package if that is required by the project plan. An example of a CAR form is shown in figure 15-1.

8.3.2 Linearity

All calibrations should be linear unless otherwise defined in the specific SOP. FGL's definition of linearity is a calibration curve that has a linear regression equal to or greater than 0.995. For organics, if a linear regression is used, a single average response factor may be used if acceptance criteria pass. Specific protocols outlined in a given SOP will take precedence over these generic policies.

E… EN…RO…ML… …AL

C… IN … C…TO…
…AN… …LYS… …QUE… …CU…

CLIENT DETAILS — SECTION I

Client: ______________________

Customer Number: ______________________

Address: ______________________

Phone: ______________________

FAX: ______________________

Project name: ______________________

Contact person: ______________________

Billing Information (if different from above)

Name: ______________________

Address: ______________________

Phone: ______________________

FAX: ______________________

Contact person: ______________________

Purchase order/contract number: ______________________

SAMPLING — SECTION II

Sampler (s) : ______________________

Comp Sampler Set up Date: __________ Time: __________

Time: __________ Mileage: __________

REPORT INFORMATION — SECTION III

Rush Analysis : Yes ____ 5 Days ____ 2 Days ____ 24 hrs. ____
Subject to surcharge

QA/QC report required : yes ________ no ________

State Form required : yes ________ no ________

Lab number : ______________________

Lab Loc: SP ☐ STK ☐ VI ☐ ________ ☐

SAMPLE INFORMATION — SECTION IV

Sample Number	Location/Description	Date Sampled	Time Sampled	Type of Sampling: Composite(C) Grab(G)	Number of Containers	Type of Containers: (G) Glass (P) Plastic (V) VOA (B) Brass	(P) Potable (NP) Non-Potable	(SW) Surface Water (GW) Ground Water (WW) Wastewater (MW) Monitoring Well (TB) Travel Blank (DW) Drinking Water	(S) Soil (SLG) Sludge (SLD) Solid (O) Oil	BacT: (Sys) System (SRC) Source (W) Waste	(LT) Leaf Tissue (PET) Petiole Tissue (PRD) Produce	Preservative: (1) NaOH + ZnAc, (2) NaOH, (3) HCl. (4) H2SO4, (5) HNO3, (6) Na2S203, (7) Other	ANALYSES REQUESTED									Sample Condition: Temperature ____ (L) Leaking (B) Broken (HS) VOA Headspace	Custody Seal (Y) (N)	

REMARKS — SECTION V

CUSTODY — SECTION VI

Relinquished by and subject to the terms and conditions on the reverse of this document:

______________________ Date ________ Time ________	Relinquished by: ______________________ Date ________ Time ________
Received by: ______________________ Date ________ Time ________	Received by: ______________________ Date ________ Time ________
Relinquished by: ______________________ Date ________ Time ________	Relinquished by: ______________________ Date ________ Time ________
Received by: ______________________ Date ________ Time ________	Received by: ______________________ Date ________ Time ________

CORPORATE OFFICE & LABORATORY
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FIELD OFFICE
Visalia, California
Tel: (209) 734-9473
Mobile: (209) 737-2399

CHAIN OF CUSTODY AND ANALYSIS REQUEST DOCUMENT

Information and directions for completion

The attached document (Chain of Custody) is designed to encompass all the pertinent information pertaining to the sample(s) to be collected/received and the subsequent analysis(es).

Please note that all sampling and analyses conducted by this laboratory are subject to the terms and conditions on the reverse side of the Chain of Custody.

SECTION I This section should be fully completed and clearly printed. If the billing address differs from the regular address. this should be especially noted.

SECTION II If the sample is to be taken by you. please clearly print the name of the sampler. the date and time. If the sample is to be taken by FGL. our certificated sampler will be responsible for this information.

SECTION III Please indicate if a rush analysis is requested. If so. please circle "yes" and the appropriate rush period required. When the chain is received at the lab. you will be notified if this rush is not available. Please indicate if a QA/QC report or a state form is required. The laboratory number and location will be assigned by FGL when the sample(s) are received at the laboratory.

SECTION IV Please number by sample and not by individual test. Each test required (from the numbered sample), should be entered in the diagonal spaces provided to the right. In addition. please ensure that all information is entered in the appropriate boxes. on the same line as the numbered sample.

SECTION V Please use this section to make specific notes: i.e. special sampling. reporting instructions. etc.

SECTION VI requires a signature by a person authorized to relinquish the sample to an FGL representative. If a sample is being shipped. a relinquishing signature is required prior to releasing the sample (properly packaged) to the shipping agent. The receipt of a copy of the shipping document. maintains the integrity of the Chain of Custody.

The correct container(s) to be used for individual tests. with appropriate preservatives can be obtained from FGL. When calling the laboratory for containers. please be specific about the analyses required and if applicable. the number of locations. Samples must be kept cool. Coolers will be provided if requested.

Color Coding of Containers All containers which contain a preservative are marked with a Color Printed Label. The color scheme conforms to industry standards where applicable. and is provided as a quick reference for locating the correct container. Preservative and corresponding labels colors are set out hereunder:

Blue	HCL pH < 2
Gold	H_2SO_4 pH < 2
Red	HNO_3 pH < 2
Black	Monochloroacetic Buffer
Green	NaOH pH > 12 or NaOH + Zinc Acetate
Black	$Na_2S_2O_3$
White	Other

WE ARE PLEASED TO HAVE THIS OPPORTUNITY TO SERVE YOU

If you have any questions or need sampling assistance, do not hesitate to call us at:

Santa Paula (805) 659 0910
Stockton (209) 942 0181
Visalia (209) 734 9473

Sample Custody

Figure 7-1 Chain of Custody

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Internal Quality Control Checks

An internal quality control program requires a set of routine internal procedures for assuring that the data generated from a measurement system meets prescribed criteria for data quality. An effective internal QC program must be capable of measuring and controlling the quality of the data, in terms of precision, accuracy, and completeness (see sections 5 and 14 for these details).

This section identifies QC protocols associated with analytical procedures. Table 11-1 is a general outline of quality control parameters monitored for each procedure. Included are general quality control measures as well as specific quality control checks which provide continual control and assessment of data quality. Figures 11-1 through 11-3 are examples of FGL Control Charts.

FGL uses continuing calibration verifications (CCV) and initial calibration verification (ICV) for instrument quality control. The laboratory control sample (LCS) is used for sample preparation quality control. The CCV standard only verifies continuing calibration. The ICV standard is used to independently verify the calibration and may take the place of CCV when used on a continuing basis during analysis. The LCS may take the place of both ICV and CCV when prepared independently and used on a continuing basis during analysis.

11.1 Quality Control Parameters

11.1.1 Initial Demonstration of Capability

Before analyzing samples, the laboratory must prove proficiency in the method by preparing a data package for certification. The laboratory normally provides the following information:

1) calibration data
2) calibration verification from an independent source
3) method detection limit data
4) detection limit verification data
5) accuracy and precision data

These must all be acceptable under the method QC criteria or, when requirements are not specified, reasonably meet good laboratory practices and Department of Health Services requirements.

11.1.2 Analysis Quality Controls

11.1.2.1 Instrument Blank

The instrument or calibration blank is used to calibrate the instrument. This blank contains the same reagents used in the standards and samples. However, the blank is prepared under controlled conditions and is not processed like all samples.

11.1.2.2 Detection Limit Standard (DLS)

Normally, method detection limits (MDLs) are performed on an annual basis. However, this doesn't adequately reflect the day-to-day variations in the analysis. FGL has taken a different approach. We perform what we call detection limit standards on a daily basis. This gives more "representative" method detection limits. Tracking the DLS using our LIMS allows us to monitor instrument and method performance. Historically, we can also prove what our MDL was at a particular time. The standard should be 3-10 times the MDL and may or may not be prepared independently of the calibration standards.

Internal Quality Control Checks

11.1.2.3 Initial Calibration Verification (ICV)

ICV is used as an independent verification of the calibration. EPA protocol recommends analysis of ICV for each analytical calibration. ICV samples are manufacturer or laboratory prepared from independent suitable reference standards. The ICV usually contains the analytes of interest at a concentration in the mid-calibration range. Method specific acceptance criteria are used when possible. When method specific criteria are unavailable, the recoveries are control charted to obtain acceptance limits.

11.1.2.4 Continuing Calibration Verification (CCV)

CCV is used to verify continuing calibration. Many EPA methods require analysis of CCV's on a per batch or per day basis. CCV samples are manufacturer or laboratory prepared from suitable reference standards. This standard may or may not be independent of the calibration stock standards. The CCV usually contains the analytes of interest at a concentration in the mid-calibration range. Method specific acceptance criteria are used when possible. When method specific criteria are unavailable the recoveries are control charted to obtain acceptance limits.

11.1.2.5 Internal Standards (IS)

An IS is a synthetic compound not occuring in an environmental sample but has chemical behavior similar to that of the target analytes. EPA protocol requires IS for specific methods on a per sample basis (including QC samples). The IS serves as a check on the analysis and corrects for instrumental drift or matrix effects. Method specific acceptance criteria are used when possible. When method specific criteria are unavailable the recoveries are control charted to obtain acceptance limits.

11.1.3 Method Quality Controls

11.1.3.1 Method Blank

The method blank is used to ensure that any positive results were not because of reagent or labware contamination. Before analyzing any samples, the analyst must demonstrate through the analysis of a method blank, that all glassware and reagents are free of contaminants. Each time a set of samples is extracted, a method blank must be processed to check for laboratory contamination. The blank samples should be carried through all stages of the sample preparation and analysis. Lack of contamination is demonstrated if all target analytes with the exception of common laboratory reagents are below their DLRs.

11.1.3.2 Field Blank

The field blank is used to ensure that any positive results were not because of contamination occurring during sampling. The field blank samples should be carried through all stages of the sample preparation and analysis. Lack of contamination is demonstrated if all target analytes with the exception of common laboratory reagents are below their DLRs.

Internal Quality Control Checks

11.1.3.3 Travel Blank

The travel blank is used to ensure that any positive results were not because of contamination occurring during shipping and handling of the samples. The travel blank samples should be carried through all stages of the sample preparation and analysis. Lack of contamination is demonstrated if all target analytes with the exception of common laboratory reagents are below their DLRs.

11.1.3.4 Laboratory Control Sample (LCS)

The LCS is used to verify overall accuracy of the method. EPA protocol requires analysis of an LCS for each analytical batch when appropriate. The LCS consists of either a control matrix spiked with analytes representative of the target analytes or a certified reference material. Whenever possible, the LCS contains the analyte of interest at a concentration in the mid-calibration range. This standard may or may not be independent of the calibration stock standards. Initially method specific acceptance criteria are used. Eventually, or when method specific criteria are unavailable, the recoveries are control charted to obtain acceptance limits.

11.1.3.5 Surrogate Spikes

Surrogate spikes serve as a check on the extraction process where extraction is a necessary part of the analytical procedure. When surrogate recovery is within limits it indicates that the extraction was complete. A surrogate is a compound not expected to occur in an environmental sample but has chemical behavior similar to that of the target analytes. EPA protocol requires surrogate spikes for specific methods on a per sample basis (including QC samples). Initially method specific acceptance criteria are used. Eventually, or when method specific criteria are unavailable, the recoveries are control charted to obtain acceptance limits.

11.1.3.6 Matrix Spike/Matrix Spike Duplicates (MS/MSD)

The MS/MSD is used to verify matrix specific precision and accuracy. EPA protocol normally requires analysis of MS/MSD samples for each analytical batch or matrix type. The MS/MSD spikes are manufacturer or laboratory prepared from suitable reference standards. This standard may or may not be independent of the calibration stock standards. The matrix spike recovery and relative percent difference (RPD) acceptance criteria are shown in Section 5. When matrix spike results fall outside limits published in the respective methods. The LCS is used to verify method control. If spike recoveries are outside normal limits due to matrix problems. the data should be reported noting matrix interference. The spike recovery and RPD acceptance limits are test specific and are control charted.

11.1.3.7 Duplicates

Duplicates are used to verify matrix specific precision. EPA protocol normally requires analysis of duplicate samples for each analytical batch or matrix type. The relative percent difference (RPD) calculated from duplicate analyses provide an assessment of precision. The RPD acceptance limits are test specific and are control charted.

Internal Quality Control Checks

11.1.4 Radiochemical Specific Quality Controls

11.1.4.1 Efficiency vs. Dissolved Solids Chart

Dissolved solids (TDS) mask or decrease the radiation picked in the proportional counters. For each instrument an efficiency vs. solids chart must be generated as part of the initial demonstration of capability. In addition, whenever an instrument is maintained or repaired (i.e. a counting wire replaced) a new efficiency vs. TDS chart must be generated. Samples containing solids such that the efficiency of a counter could drop below ten percent must be reprepared using a smaller aliquot so that the solids give acceptable counting efficiency. Whenever possible an electrical conductivity measurement is used to estimate TDS and sample aliquots.

11.1.4.2 Background

Background samples are run daily, prior to sample analysis. However, monthly average may be used for calculation purposes. If a run background is used for sample calculation the background must be within 2 standard deviations of the monthly average to be acceptable.

11.1.4.3 Minimum Detectable Activity (MDA)

MDA's are calculated every six months. This data is used to determine if a sample is not detectable. EPA guidelines for sensitivity are followed for each isotope. MDA'scan be calculated on per sample basis. Background samples are run daily, prior to sample analysis. However, monthly average may be used for calculation purposes.

Internal Quality Control

Table 11-1 Quality Controls for Drinking Water Methods

TEST	DLS	INST BLANK	METHOD BLANK	CCV	ICV	LCS	BS/BSD	MS/MSD	DUP	SURR	I.S.
Semivolatile Organics											
EPA 501.2	Daily	Batch	Batch			Batch		Batch			
EPA 504	Daily	Batch	Batch			Batch		Batch			
EPA 505	Daily	Batch	Batch			Batch		Batch			
EPA 507	Daily	Batch	Batch			Batch		Batch		Sample	
EPA 508	Daily	Batch	Batch			Batch		Batch		Sample	
EPA 508A	Daily	Batch	Batch			Batch		Batch			
EPA 510	Daily	Batch	Batch			Batch		Batch			
EPA 515.1	Daily	Batch	Batch			Batch		Batch		Sample	
EPA 525	Daily	Batch	Batch			Batch		Batch		Sample	Sample
EPA 531	Daily	Batch	Batch			Batch		Batch		Sample	
EPA 547	Daily	Batch	Batch			Batch		Batch			
EPA 548	Daily	Batch	Batch			Batch		Batch		Sample	
EPA 549	Daily	Batch	Batch			Batch		Batch			
EPA 550.1	Daily	Batch	Batch			Batch		Batch		Sample	
EPA 552	Daily	Batch	Batch			Batch		Batch		Sample	
TOC	Daily	Batch			Batch			Batch			
TOX	Daily	Batch			Batch			Batch			
Volatile Organics											
EPA 502.2	Daily	Batch			Batch			Batch		Sample	Sample
EPA 524.2	Daily	Batch			Batch			Batch		Sample	Sample
Inorganic Chemicals											
Alkalinity	Daily				Batch				Batch		
Ammonia	Daily	Batch			Batch			Batch			
BOD	Daily	Batch				Batch			Batch		
Carbon Dioxide									Batch		
COD	Daily	Daily				Batch		Batch			
COD, % Transmittance	Daily	Daily				Batch		Batch			
Cl Res., colorimetric	Daily	Batch			Batch				Batch		
Cl Res., titrimetric					Batch				Batch		

Internal Quality Control

Table 11-1 Quality Controls for Drinking Water Methods

TEST	DLS	INST BLANK	METHOD BLANK	CCV	ICV	LCS	BS/BSD	MS/MSD	DUP	SURR	I.S.
Inorganic Chemical continued											
Cyanide, Free	Daily	Batch			Batch			Batch			
Cyanide, Total	Daily	Batch	Batch	Batch			Batch	Batch			
E.C.	Daily				Batch				Batch		
Fluoride (Distillation)		Batch	Batch			Batch		Batch			
Fluoride	Daily	Batch			Batch			Batch			
Gen. Physical									Batch		
Ignitability				Batch					Batch		
Ion Chromatography	Daily	Batch			Batch			Batch			
MBAS Extraction	Daily	Batch				Batch		Batch			
MBAS Screen										Batch	
Moisture, percent										Batch	
Oxygen, Dissolved										Batch	
Nitrate - Technicon	Daily	Batch			Batch			Batch			
Nitrite - Technicon	Daily	Batch			Batch			Batch			
Oil & Grease, Pet	Daily	Batch				Batch	Batch				
Oil & Grease, Sox	Daily	Batch				Batch	Batch				
Oil & Grease	Daily	Batch				Batch	Batch				
pH					Batch				Batch		
pH, Adjustment										Batch	
Phenols	Daily	Batch	Batch			Batch		Batch			
Phosphorous, Total	Daily	Batch	Batch			Batch		Batch			
Reactivity, Generation										Batch	
Reactivity									Batch		
Solids, Fixed	Daily	Batch				Batch			Batch		
Solids, Settleable											
Solids, Total	Daily	Batch				Batch			Batch		
Solids, T. Dissolved	Daily	Batch				Batch			Batch		
Solids, T. Suspended	Daily	Batch				Batch			Batch		
Solids, Volatile	Daily	Batch							Batch		
Solids, V. Suspended	Daily	Batch							Batch		
Sulfide, Diss									Batch		

Internal Quality Control

Table 11-1 Quality Controls for Drinking Water Methods

TEST	DLS	INST BLANK	METHOD BLANK	CCV	ICV	LCS	BS/BSD	MS/MSD	DUP	SURR	I.S.
Inorganic Chemical continued											
Sulfide, Total									Batch		
Sulfite									Batch		
TKN	Daily	Batch				Batch		Batch			
Tannin & Lignin	Daily	Batch				Batch		Batch			
Trace Metals											
Cr VI	Daily	Batch			Batch			Batch			Batch
FAA	Daily	Batch				Batch		Batch			
GFAA	Daily	Batch				Batch		Batch			
ICP	Daily	Batch				Batch		Batch			
ICP/MS	Daily	Batch				Batch		Batch			Sample
Hg - CVAA	Daily	Batch				Batch		Batch			
Radiochemistry											
Gross A & B		Batch						Batch			
Gamma		Batch						Batch			
Nuclide Screen		Batch					Batch				
Radium 226		Batch					Batch				
Radium 228		Batch					Batch				
Radium 226 & 228		Batch					Batch				
Radon		Batch							Batch		
Strontium 90		Batch					Batch				
Tritium		Batch					Batch				
Uranium		Batch					Batch				

Internal Quality Control

Table 11-2 Quality Controls for Wastewater / Hazardous Waste Liquid Methods

TEST	DLS	INST BLANK	METHOD BLANK	CCV	ICV	LCS	BS/BSD	MS/MSD	DUP	SURR	I.S.
Semivolatile Organics											
EPA 3510			Batch			Batch		Batch			
EPA 3520			Batch			Batch		Batch			
EPA 3540			Batch			Batch		Batch			
EPA 3550			Batch			Batch		Batch			
EPA 3580			Batch			Batch			Batch		
TCLP			Batch						Batch		
EPA 8015	Daily	Batch			Batch						
EPA 8015M (Purgeable)	Daily	Batch			Batch						
EPA 8015M (Extract)	Daily	Batch			Batch						
EPA 604/8040	Daily	Batch			Batch						Sample
EPA 608/8080	Daily	Batch			Batch					Sample	
EPA 610/8310	Daily	Batch			Batch						
EPA 614/8140	Daily	Batch			Batch						Sample
EPA 615/8150	Daily	Batch			Batch						
EPA 625/8270	Daily	Batch			Batch						Sample
EPA 632	Daily	Batch			Batch						
TOC	Daily	Batch			Batch			Batch			
TOX	Daily	Batch			Batch			Batch			
TPH by IR	Daily	Batch	Batch			Batch		Batch			
Volatile Organics											
EPA 601/8010	Daily	Batch			Batch			Batch		Sample	Sample
EPA 602/8020	Daily	Batch			Batch			Batch		Sample	
EPA 624/8240	Daily	Batch			Batch			Batch		Sample	Sample
Inorganic Chemicals											
Alkalinity	Daily				Batch				Batch		
Ammonia	Daily	Batch			Batch			Batch			
BOD	Daily	Batch				Batch			Batch		
Carbon Dioxide										Batch	
COD	Daily	Daily				Batch		Batch			

Internal Quality Control

Table 11-2 Quality Controls for Wastewater / Hazardous Waste Liquid Methods

TEST	DLS	INST BLANK	METHOD BLANK	CCV	ICV	LCS	BS/BSD	MS/MSD	DUP	SURR	I.S.
Inorganic Chemicals continued											
COD, % Transmittance	Daily	Daily				Batch		Batch			
Cl Res., colorimetric	Daily	Batch			Batch				Batch		
Cl Res., titrimetric					Batch				Batch		
Cyanide, Free	Daily	Batch			Batch			Batch			
Cyanide, Total	Daily	Batch	Batch	Batch			Batch	Batch			
E.C.	Daily				Batch				Batch		
Fluoride (Distillation)		Batch	Batch			Batch		Batch			
Fluoride	Daily	Batch			Batch			Batch			
Gen. Physical									Batch		
Ignitability				Batch					Batch		
Ion Chromatography	Daily	Batch			Batch			Batch			
MBAS Extraction	Daily	Batch				Batch		Batch			
MBAS Screen									Batch		
Moisture, percent										Batch	
Oxygen, Dissolved									Batch		
Nitrate - Technicon	Daily	Batch			Batch			Batch			
Nitrite - Technicon	Daily	Batch			Batch			Batch			
Oil & Grease, Pet	Daily	Batch				Batch	Batch				
Oil & Grease, Sox	Daily	Batch				Batch	Batch				
Oil & Grease	Daily	Batch				Batch	Batch				
pH					Batch				Batch		
pH, Adjustment										Batch	
Phenols	Daily	Batch	Batch			Batch		Batch			
Phosphorus, Total	Daily	Batch	Batch			Batch		Batch			
Reactivity, Generation									Batch		
Reactivity									Batch		
Solids, Fixed	Daily	Batch				Batch			Batch		
Solids, Settleable											
Solids, Total	Daily	Batch				Batch			Batch		
Solids, T. Dissolved	Daily	Batch				Batch			Batch		
Solids, T. Suspended	Daily	Batch				Batch			Batch		

Internal Quality Control

Table 11-2 Quality Controls for Wastewater / Hazardous Waste Liquid Methods

TEST	DLS	INST BLANK	METHOD BLANK	CCV	ICV	LCS	BS/BSD	MS/MSD	DUP	SURR	I.S.
Inorganic Chemicals continued											
Solids, Volatile	Daily	Batch							Batch		
Solids, V. Suspended	Daily	Batch							Batch		
Sulfide, Diss									Batch		
Sulfide, Total									Batch		
Sulfite									Batch		
TKN	Daily	Batch				Batch		Batch			
Tannin & Lignin	Daily	Batch				Batch		Batch			
Trace Metals											
3015			Batch			Batch		Batch			
STLC			Batch						Batch		
TCLP			Batch			Batch		Batch			
Cr VI	Daily	Batch	Batch			Batch		Batch			
FAA	Daily	Batch			Batch						
GFAA	Daily	Batch			Batch						
ICP	Daily	Batch			Batch						
ICP/MS	Daily	Batch			Batch						Sample
Hg - CVAA	Daily	Batch			Batch						
Radiochemistry											
Gross A & B		Batch					Batch				
Gamma		Batch						Batch			
Nuclide Screen		Batch					Batch				
Radium 226		Batch					Batch				
Radium 228		Batch					Batch				
Radon		Batch							Batch		
Radium 226 & 228		Batch					Batch				
Strontium 90		Batch					Batch				
Tritium		Batch					Batch				
Uranium		Batch					Batch				

Internal Quality Control

Table 11-3 Quality Controls for Solid Waste / Hazardous Waste Methods

TEST	DLS	INST BLANK	METHOD BLANK	CCV	ICV	LCS	BS/BSD	MS/MSD	DUP	SURR	I.S.
Semivolatile Organics											
EPA 3510			Batch			Batch		Batch			
EPA 3520			Batch			Batch		Batch			
EPA 3540			Batch			Batch		Batch			
EPA 3550			Batch			Batch		Batch			
EPA 3580			Batch			Batch			Batch		
TCLP			Batch						Batch		
EPA 8015	Daily	Batch			Batch						
EPA 8015M (Diesel)	Daily	Batch			Batch						
EPA 8015M (Gas)	Daily	Batch			Batch						Sample
EPA 8040	Daily	Batch			Batch						Sample
EPA 8080	Daily	Batch			Batch						
EPA 8140	Daily	Batch			Batch						Sample
EPA 8150	Daily	Batch			Batch						
EPA 8310	Daily	Batch			Batch						
EPA 632	Daily	Batch			Batch						
EPA 8270	Daily	Batch			Batch						
TOC	Daily	Batch			Batch			Batch			
TOX	Daily	Batch			Batch			Batch			
TPH by IR	Daily	Batch	Batch		Batch			Batch			
Volatile Organics											
TCLP			Batch						Batch		
EPA 601/8010	Daily	Batch			Batch			Batch		Sample	Sample
EPA 602/8020	Daily	Batch			Batch			Batch		Sample	
EPA 624/8240	Daily	Batch			Batch			Batch		Sample	Sample
EPA 8260	Daily	Batch			Batch			Batch		Sample	Sample

Internal Quality Control

Table 11-3 Quality Controls for Solid Waste / Hazardous Waste Methods

TEST	DLS	INST BLANK	METHOD BLANK	CCV	ICV	LCS	BS/BSD	MS/MSD	DUP	SURR	I.S.
Solids Inorganic Chemicals											
Ammonia	Daily	Batch				Batch		Batch			
Corrosivity (pH)					Batch				Batch		
Cyanide, Total	Daily	Batch	Batch	Batch			Batch		Batch		
E.C.	Daily				Batch				Batch		
Fluoride (Distillation)		Batch	Batch			Batch		Batch			
Ignitability				Batch					Batch		
Ion Chromatography	Daily	Batch				Batch		Batch			
Moisture, percent										Batch	
Nitrate - Technicon	Daily	Batch				Batch		Batch			
Nitrite - Technicon	Daily	Batch				Batch		Batch			
Oil & Grease, Sox	Daily	Batch				Batch	Batch				
Oil & Grease	Daily	Batch				Batch	Batch				
pH				Batch					Batch		
Phenols	Daily	Batch	Batch			Batch		Batch			
Phosphorus (See Trace metals - ICP)											
Reactivity, Generation									Batch		
Reactivity									Batch		
Solids, Percent									Batch		
Sulfide, Total									Batch		
TKN	Daily	Batch				Batch	Batch	Batch			
Trace Metals											
3050			Batch			Batch		Batch			
STLC			Batch						Batch		
TCLP			Batch			Batch		Batch			
Cr VI	Daily	Batch	Batch			Batch		Batch			
FAA	Daily	Batch			Batch						
GFAA	Daily	Batch			Batch						
ICP	Daily	Batch			Batch						
ICP/MS	Daily	Batch			Batch						Sample
Hg - CVAA	Daily	Batch			Batch						

Internal Quality Control

Table 11-3 Quality Controls for Solid Waste / Hazardous Waste Methods

TEST	DLS	INST BLANK	METHOD BLANK	CCV	ICV	LCS	BS/BSD	MS/MSD	DUP	SURR	I.S.
Radiochemistry											
Gross A & B		Batch					Batch				
Gamma		Batch						Batch			
Nuclide Screen		Batch					Batch				
Radium 226		Batch					Batch				
Radium 228		Batch					Batch				
Radium 226 & 228		Batch					Batch				
Radon		Batch							Batch		
Strontium 90		Batch					Batch				
Tritium		Batch					Batch				
Uranium		Batch					Batch				

Internal Quality Control Checks

Figure 11-1 FGL Control Chart for LCS

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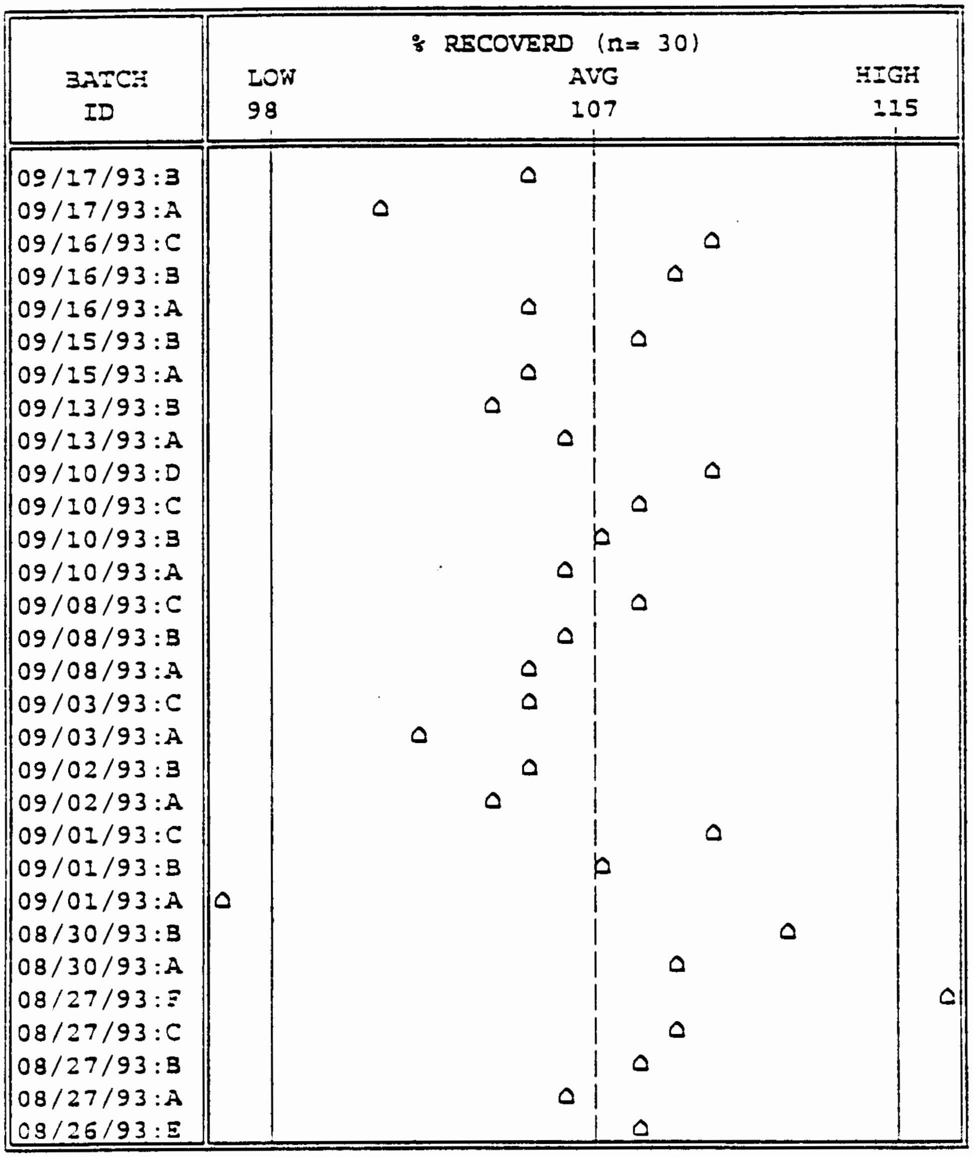
QALCS-LBW

FGL ENVIRONMENTAL TREND CONTROL CHART

300.0 Anions for CL

09/23/93



Δ/■ => Matrix Spike / Dup

Reporting Limits : AR % 98 - 115 MAV % ____ on 9/23/93 by: CO / 10/18/93 EA

OK KRW

QALCS-LBW

FGL ENVIRONMENTAL TREND CONTROL CHART

300.0 Anions for CL

09/23/93

BATCH ID	DATE COMPLETED	Theo. Conc.	MS %	MSD %	AR %	See Notes
09/17/93:B	09/17/93	213	105	75-125		
09/17/93:A	09/17/93	213	101	75-125		
09/16/93:C	09/16/93	213	110	75-125		
09/16/93:B	09/16/93	213	109	75-125		
09/16/93:A	09/16/93	213	105	75-125	1	
09/15/93:B	09/15/93	213	108	75-125		
09/15/93:A	09/15/93	213	105	75-125		
09/13/93:B	09/13/93	213	104	75-125		
09/13/93:A	09/13/93	213	106	75-125		
09/10/93:D	09/10/93	213	110	75-125		
09/10/93:C	09/10/93	213	108	75-125		
09/10/93:B	09/10/93	213	107	75-125		
09/10/93:A	09/10/93	213	106	75-125		
09/08/93:C	09/08/93	213	108	75-125		
09/08/93:B	09/08/93	213	106	75-125		
09/08/93:A	09/08/93	213	105	75-125		
09/03/93:C	09/03/93	213	105	75-125		
09/03/93:A	09/03/93	213	102	75-125		
09/02/93:B	09/02/93	213	105	75-125		
09/02/93:A	09/02/93	213	104	75-125		
09/01/93:C	09/01/93	213	110	75-125		
09/01/93:B	09/01/93	213	107	75-125		
09/01/93:A	09/01/93	213	95.2	75-125		
08/30/93:B	08/30/93	213	112	75-125		
08/30/93:A	08/30/93	213	109	75-125		
08/27/93:F	08/27/93	213	121	75-125		
08/27/93:C	08/27/93	213	109	75-125		
08/27/93:B	08/27/93	213	108	75-125		
08/27/93:A	08/27/93	213	106	75-125		
08/26/93:E	08/26/93	213	108	75-125		

Internal Quality Control Checks

Figure 11-2 FGL Control Chart for MS/MSD and RPD

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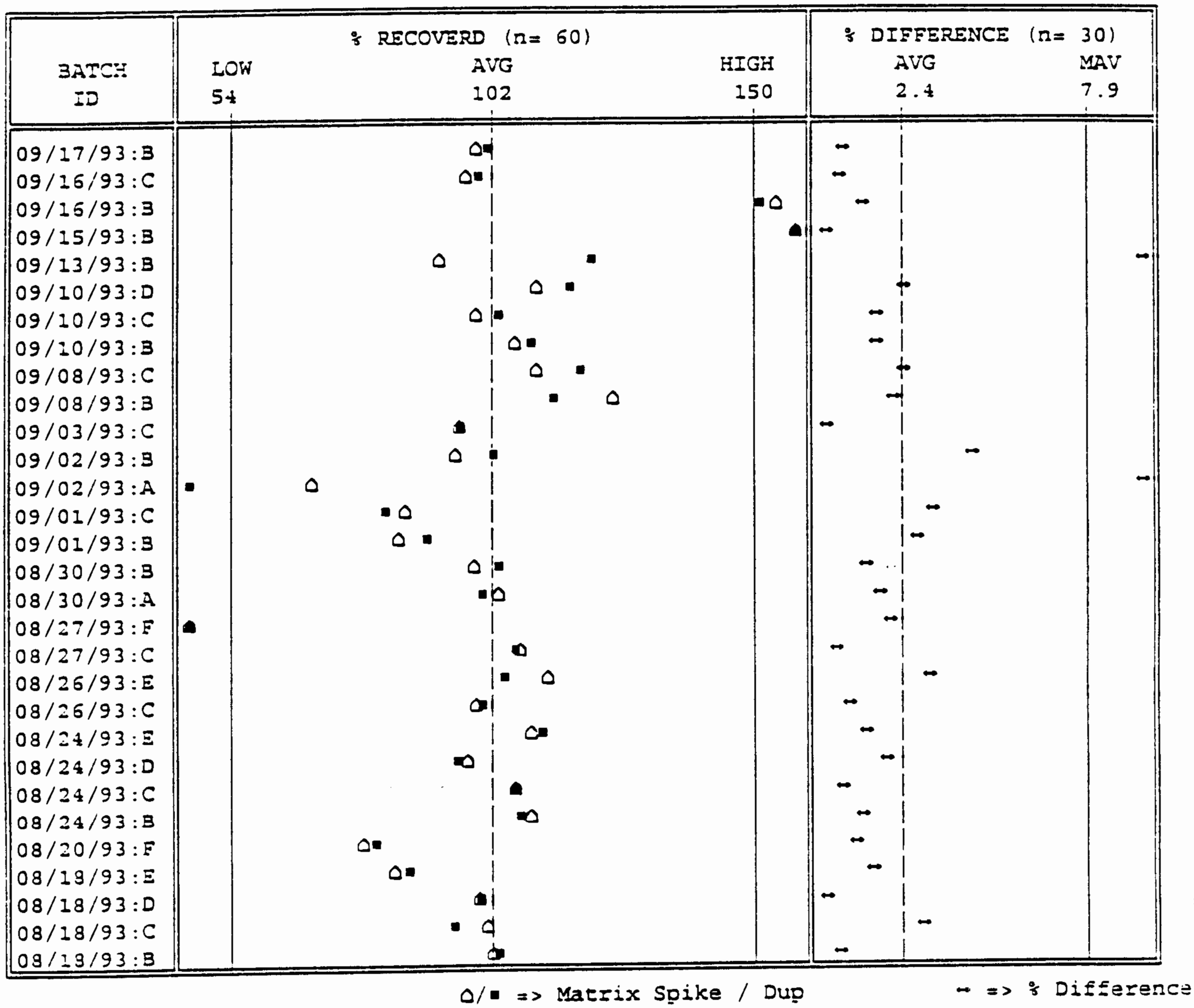
QAMS-WW

FGL ENVIRONMENTAL TREND CONTROL CHART

300.0 Anions for CL

09/23/93



Reporting Limits : AR % 54 - 150 MAV % 7.9 on 9/23/93 by: [signature] 10/18/93

OK KRW

QAMS-WW

FGL ENVIRONMENTAL TREND CONTROL CHART

300.0 Anions for CL

09/23/93

BATCH ID	DATE COMPLETED	Theo. Conc.	MS %	AR %	DIFF. %	MAV %	See Notes		
09/17/93:B	09/17/93	100	98.9	101	75-125	0.6	20.0	10	
09/16/93:C	09/16/93	40.0	96.9	99.3	75-125	0.5	20.0		
09/16/93:B	09/16/93	100	154	151	75-125	1.2	20.0		*
09/15/93:B	09/15/93	145	180	180	75-125	0.1	20.0		*
09/13/93:B	09/13/93	100	92.0	120	75-125	13.4	20.0		*
09/10/93:D	09/10/93	100	110	116	75-125	2.4	20.0		
09/10/93:C	09/10/93	200	98.9	103	75-125	1.6	20.0		
09/10/93:B	09/10/93	100	106	109	75-125	1.6	20.0		
09/08/93:C	09/08/93	100	110	118	75-125	2.4	20.0	10	
09/08/93:B	09/08/93	200	124	113	75-125	2.1	20.0		
09/03/93:C	09/03/93	100	95.7	95.8	75-125	0.1	20.0		
09/02/93:B	09/02/93	100	95.0	102	75-125	4.5	20.0		
09/02/93:A	09/02/93	100	68.6	46.0	75-125	14.1	20.0	10	
09/01/93:C	09/01/93	200	85.7	82.0	75-125	3.3	20.0	13	
09/01/93:B	09/01/93	200	84.5	89.7	75-125	2.8	20.0		
08/30/93:B	08/30/93	100	98.5	103	75-125	1.3	20.0		
08/30/93:A	08/30/93	100	103	100	75-125	1.7	20.0		
08/27/93:F	08/27/93	4000	45.7	38.0	75-125	2.0	20.0	10	
08/27/93:C	08/27/93	100	107	106	75-125	0.4	20.0	10	
08/26/93:E	08/26/93	200	112	104	75-125	3.2	20.0	10	
08/26/93:C	08/26/93	40.0	98.9	100	75-125	0.8	20.0		
08/24/93:E	08/24/93	50.0	109	111	75-125	1.3	20.0		
08/24/93:D	08/24/93	625	97.2	95.3	75-125	1.9	20.0		
08/24/93:C	08/24/93	250	106	106	75-125	0.6	20.0	13	
08/24/93:B	08/24/93	250	109	107	75-125	1.2	20.0		
08/20/93:F	08/20/93	50.0	77.9	80.3	75-125	1.0	20.0		
08/18/93:E	08/18/93	250	83.8	86.4	75-125	1.5	20.0	13	
08/18/93:D	08/18/93	100	99.5	99.7	75-125	0.1	20.0	10	
08/18/93:C	08/18/93	100	101	94.7	75-125	3.0	20.0	10	
08/18/93:B	08/18/93	40.0	102	103	75-125	0.5	20.0	13	

Performance and System Audits

The Quality Assurance Director or Officer is responsible for internal system audits, coordinating all external audits and performance evaluation (PE) samples. In addition, the QA Director or Officer is responsible for maintaining state and agency certification.

12.1 System Audits

System audits are performed both by external agencies, and by the laboratory Quality Assurance group. The focus of these audits is the overall analytical "system", from login to delivery of the finished reports. The purpose of the audit is to document compliance with the specified methodology contained in our Standard Operating Procedures (SOPs).

12.1.1 Internal System Audit Program

Internal system audits are conducted on a monthly basis. Several analytical methods are selected each month for a systems audit. Compliance with all the required QC is evaluated and indicated on the QA inspection summary report form (figure 16-1). This report contains all the new nonconformance items, previously uncompleted non-conformance items and finally all non-conformance items completed. Dates are recorded when the non-conformance was found and when it was completed. This report is given to all supervisors and managers. With these steps an ongoing quantitative assessment of the analytical system is provided.

12.1.2 External System Audits

System audits are performed by outside government agencies such as the California Department of Health Services, Lawrence Livermore National Laboratory and the Army Corp of Engineers. Audits are also performed by private agencies such as Chemical Waste Management, Inc.

12.2 Performance Evaluation Samples

Performance evaluation audits are used to provide a direct evaluation of the ability of the analytical systems to generate data that is consistent with the laboratory's stated objectives for accuracy and precision. External PE samples are analyzed as part of the certification and approval process for various state and federal agencies, as well as for other organizations.

12.2.1 External Performance Evaluation Samples

Performance evaluation samples are analyzed for a number of outside agencies including:

(1) USEPA semi-annual drinking water check samples (WS series)
(2) USEPA semi-annual wastewater check samples (WP series)
(3) USEPA annual wastewater check samples (DMR studies)
(4) EMSL. Las Vegas, radiochemistry check samples
(6) DOE, Environmental Measurements Laboratory QA Program

12.3 Certifications, Accreditations and Agency Approvals

FGL Environmental participates in laboratory certification programs with California, and other states. A copy of the California Environmental Laboratory Accredititation Program (ELAP) approved analyses list may be found in Figures 12-3 and 12-4. A copy of the Nevada Department of Human Resources approved analyses list may be found in Figure 12-5.

Performance and System Audits

Figure 12-1 FGL QA Inspection Form

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FGL - Santa Paula QC Inspection Report

Date:______________________________

Inspector:__________________________

Item	In Compliance?	Corrective Action
Overall -		
Oven Temps	____________	________________________________
Ref. Temps	____________	________________________________
Balance Checks	____________	________________________________
Container Checks	____________	________________________________
QC SOP's	____________	________________________________

Comments:____

____

Front Office and Login -

Sample #'s - ____

____

LIMS Logbook	____________	________________________________
File Tracking		
Chain of Custody	____________	________________________________
Report	____________	________________________________
Bill	____________	________________________________
Training	____________	________________________________
SOP's	____________	________________________________

Comments:____

____

____

Bacteriology -		
D.W. Prep Log	____________	________________________________
W.W. Prep Log	____________	________________________________
P.C. Prep Log	____________	________________________________
Client Notifications	____________	________________________________
Media Prep Log	____________	________________________________
Autoclave Temps	____________	________________________________
Incubator Temps	____________	________________________________
Water Suitability	____________	________________________________
Corrective Actions	____________	________________________________

Bact Method Check

Method:______________ Sample #:______________ Date Comp:______________

Analyst Training	____________	________________________________
SOP	____________	________________________________

Comments:____

____

____

Item	In Compliance?	Corrective Action
Inorganics -		
Standard Prep Log		
Corrective Actions		
Water Suitability		
Instrument Maintenance:		
Dionex DX-300		
P.E. Lambda 3		
Turner Neph.		
Fisher pH/ISE		
Orion E.C.		
Orion BOD		
P.E. 5000		
P.E. 5100		
Fisons PQ-II		
Leeman PS200		

Wet Chemistry Method Checks

Method:________________ Sample #:________________ Date Comp:________________

Data Package		
Batch QC Report		
Reviewed Report		
Batch Sheet		
Inst. Printout		
Control Charts		
Analyst Training		
SOP		

Method:________________ Sample #:________________ Date Comp:________________

Data Package		
Batch QC Report		
Reviewed Report		
Batch Sheet		
Inst. Printout		
Control Charts		
Analyst Training		
SOP		

Metals Method Check

Method:________________ Sample #:________________ Date Comp:________________

Data Package		
Batch QC Report		
Reviewed Report		
Batch Sheet		
Inst. Printout		
Control Charts		
Analyst Training		
SOP		

Comments:____

Item	In Compliance?	Corrective Action
Organics -		
GC Lab:		
Standard prep Log		
Corrective Actions		
Instrument Maintenance:		
GC 1		
GC 2		
GC 4		
GC 5		
GC 7		
GC 8		
Hitachi HPLC		
HP HPLC		
IR		

GC Lab Method Check

Method:________________ Sample #:________________ Date Comp:________________

Item	In Compliance?	Corrective Action
Data Package		
Batch QC Report		
Reviewed Report		
Batch Sheet		
Inst. Printout		
Control Charts		
Analyst Training		
SOP		

Item	In Compliance?	Corrective Action
GC/MS Lab:		
Standard prep Log		
Corrective Actions		
Instrument Maintenance:		
GC/MS 1		
GC/MS 2		
GC/MS 3		
GC/MS 4		
MCI TOX		
Astro TOC		

GC/MS Lab Method Check

Method:________________ Sample #:________________ Date Comp:________________

Item	In Compliance?	Corrective Action
Data Package		
Batch QC Report		
Reviewed Report		
Batch Sheet		
Inst. Printout		
Control Charts		
Analyst Training		
SOP		

Comments:____

Item	In Compliance?	Corrective Action
Radioactivity -		
Standard Prep. Log	______	______
Corrective Actions	______	______
Instrument Maintenance:		
Alpha 1	______	______
Alpha 2	______	______
Alpha 5	______	______
Alpha 6	______	______
Alpha 7	______	______
Alpha/Beta 3	______	______
Alpha/Beta 4	______	______
Alpha/Beta 8	______	______
Liquid Scintillation	______	______
Gamma Spec.	______	______

Radiochemistry Method Check

Method:__________ Sample #:__________ Date Comp:__________

Data Package		
Batch QC Report	______	______
Reviewed Report	______	______
Batch Sheet	______	______
Inst. Printout	______	______
Control Charts	______	______
Analyst Training	______	______
SOP	______	______

Ag Lab -		
Standard Prep. Log	______	______
Corrective Actions	______	______
Instrument Maintenance:		
Technicon - nitrate	______	______
Technicon - TKN	______	______
LECO	______	______
pH meter	______	______
E.C. meter	______	______
ARL 3410	______	______

Ag Method Check

Method:__________ Sample #:__________ Date Comp:__________

Data Package		
Batch QC Report	______	______
Reviewed Report	______	______
Batch Sheet	______	______
Inst. Printout	______	______
Control Charts	______	______
Analyst Training	______	______
SOP	______	______

Comments:____

____

____

Performance and System Audits

Figure 12-2 FGL Santa Paula - CA DHS ELAP Certification

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ENVIRONMENTAL LABORATORY ACCREDITATION/REGISTRATION
List of Approved Fields of Testing and Analytes

FGL Environmental Laboratory 853 Corporation Street Santa Paula, CA	TELEPHONE No: (805) 659-0910 CALIFORNIA COUNTY: Ventura	CERTIFICATE NUMBER: 1573 EXPIRATION DATE: 7/31/95

1 Microbiology of Drinking Water and Wastewater (07-15-91)

1.1	Total Coliforms in Drinking Water by Multiple Tube Fermentation	Y
1.2	Fecal Coliforms/E. Coli in Drinking Water by MTF	Y
1.3	Total Coliforms in Drinking Water by Membrane Filter Technics	N
1.4	Fecal Coliforms/E. Coli in Drinking Water by Membrane Filter Technics	N
1.5	Total Coliforms and E. Coli in Drinking Water by MMO-MUG	Y
1.6	Total Coliforms in Drinking Water by Clark's Presence/Absence	N
1.7	Fecal Coliforms/E. Coli in Drinking Water by Clark's Presence/Absence	N
1.8	Heterotrophic Plate Count	Y
1.9	Total Coliforms in Wastewater by Multiple Tube Fermentation	Y
1.10	Fecal Coliforms in Wastewater by MTF	Y
1.11	Total Coliforms in Wastewater by Membrane Filter Technics	N
1.12	Fecal Coliforms in Wastewater by Membrane Filter Technics	N
1.13	Fecal Streptococci or Enterococci by Multiple Tube Technics	N
1.14	Fecal Streptococci or Enterococci by Membrane Filter Technics	N

2 Inorganic Chemistry and Physical Properties of Drinking Water excluding Toxic Chemical Elements (07-15-91)

2.1	Alkalinity	Y
2.2	Calcium	Y
2.3	Chloride	Y
2.4	Corrosivity	Y
2.5	Fluoride	Y
2.6	Hardness	Y
2.7	Magnesium	Y
2.8	MBAS	Y
2.9	Nitrate	Y
2.10	Nitrite	Y
2.11	Sodium	Y
2.12	Sulfate	Y
2.13	Total Filterable Residue and Conductivity	Y
2.14	Iron (Colorimetric Methods Only)	N
2.15	Manganese (Colorimetric Methods Only)	N
2.16	Phosphate, ortho	Y
2.17	Silica (Colorimetric Methods Only)	N
2.18	Cyanide	Y

3 Analysis of Toxic Chemical Elements in Drinking Water (07-15-91)

3.1	Arsenic	Y
3.2	Barium	Y
3.3	Cadmium	Y
3.4	Chromium, total	Y
3.5	Copper	Y
3.6	Iron	Y
3.7	Lead	Y
3.8	Manganese	Y
3.9	Mercury	Y
3.10	Selenium	Y
3.11	Silver	Y
3.12	Zinc	Y
3.13	Aluminum	Y
3.14	Asbestos	N
3.15	EPA Method 200.7	Y
3.16	EPA Method 200.8 (Unregulated Elements and Lead Only)	Y
3.17	Antimony	Y
3.18	Beryllium	Y
3.19	Nickel	Y
3.20	Thallium	Y

4 Organic Chemistry of Drinking Water (measurement by GC/MS combination) (07-15-91)

4.1	EPA Method 501.3	N
4.2	EPA Method 524.2	Y
4.3	EPA Method 525	Y
4.4	EPA Method 513	N

5 Organic Chemistry of Drinking Water (excluding measurements by GC/MS combination) (07-15-91)

5.1	EPA Method 501.1	N
5.2	EPA Method 501.2	Y
5.3	EPA Method 502.1	N
5.4	EPA Method 502.2	N
5.5	EPA Method 503.1	N
5.6	EPA Method 504	Y
5.7	EPA Method 505	Y
5.8	EPA Method 506	N
5.9	EPA Method 507	Y
5.10	EPA Method 508	Y
5.11	EPA Method 508A	Y
5.12	EPA Method 510.1	N
5.13	EPA Method 515.1	Y
5.14	EPA Method 531.1	Y
5.15	EPA Method 547	Y
5.16	EPA Method 548	Y
5.17	EPA Method 549	Y
5.18	EPA Method 550	Y
5.19	EPA Method 550.1	N
5.20	EPA Method 551	Y
5.21	EPA Method 552	Y

Performance and System Audits

Figure 12-3 FGL Stockton - CA DHS ELAP Certification

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CERTIFICATE NUMBER: 1573
EXPIRATION DATE: 7/31/95

6 Radiochemistry (07-15-91)

6.1 Gross Alpha and Beta Radiation ----- Y
6.2 Total Radium ---------------------- Y
6.3 Radium 226 ------------------------ Y
6.4 Uranium --------------------------- Y
6.5 Radon 222 ------------------------- Y
6.6 Radioactive Cesium ---------------- N
6.7 Iodine 131 ------------------------ N
6.8 Radioactive Strontium ------------- Y
6.9 Tritium --------------------------- Y
6.10 Gamma and Photon Emitters ---------- N
6.11 Gross Alpha by Co-precipitation --------- Y
6.12 Radium 228 ---------------------------- Y
6.13 Radioactive Iodine -------------------- N
6.14 Gross Alpha & Beta in Hazardous Wastes -- Y
6.15 Alpha Emitting Radium Isotopes in Haz. Wastes ------------------------ Y
6.16 Radium 228 in Hazardous Wastes ---------- Y

7 Shellfish Sanitation (--------)

7.1 Shellfish meat Microbiology -- N
7.2 Paralytic Shellfish Poison --- N
7.3 Domoic Acid -- N

8 Aquatic Toxicity Bioassays (------)

8.1 Hazardous Waste Aquatic Toxicity Bioassay (Title 22, CCR, 66261.24(a)(6)) ----------------------- N
8.2 Wastewater Testing According to Kopperdahl (1976) using Freshwater Fish. ------------------------ N
8.3 Wastewater Testing According to EPA/600/4-85/013 using Freshwater and/or Marine Organisms --------- N
8.4 Wastewater Testing by EPA Method 1000.0 -- N
8.5 Wastewater Testing by EPA Method 1002.0 -- N
8.6 Wastewater Testing by EPA Method 1003.0 -- N
8.7 Wastewater Testing by EPA Method 1006 -- N
8.8 Wastewater Testing by EPA Method 1007 -- N
8.9 Wastewater Testing by EPA Method 1009 -- N
8.10 Wastewater Testing According to Anderson, et. al. (1990) using Giant Kelp (*Macrocystis pyrifera*) -- N
8.11 Wastewater Testing According to Anderson, et. al. (1990) using Red Abalone (*Haliotus rufescens*) --- N
8.12 Wastewater Testing According to Dinnel and Stober (1987) using Purple Sea Urchin (*Strongylocentrotus purpuratus*) -- N
8.13 Wastewater Testing According to Dinnel and Stober (1987) using Red Sea Urchin (*Strongylocentrotus franciscanus*) -- N
8.14 Wastewater Testing According to Dinnel and Stober (1987) using Sand Dollar (*Dendraster excentricus*) -- N
8.15 Wastewater Testing According to procedure E 724-89 (ASTM, 1989) using Pacific Oyster (*Crassostrea gigas*) -- N
8.16 Wastewater Testing According to procedure E 724-89 (ASTM, 1989) using California Bay Mussel (*Mytilus edulis*) -- N
8.17 Wastewater Testing According to Standard Methods (APHA, 1989) using an alga (*Skeletonema costatum*) -- N
8.18 Wastewater Testing According to EPA/600/4-90/027 using Freshwater and/or Marine Organisms --------- N

9 Physical Properties Testing of Hazardous Waste (07-15-91)

9.1 Ignitability by Flashpoint determination (Title 22, CCR, 66261.21) ------------------------------ Y
9.2 Corrosivity - pH determination (Title 22, CCR, 66261.22) --- Y
9.3 Corrosivity - Corrosivity towards steel (Title 22, CCR, 66261.22) -------------------------------- N
9.4 Reactivity (Title 22, CCR, 66261.23) --- Y

10 Inorganic Chemistry and Toxic Chemical Elements of Hazardous Waste

10.1 Antimony
7040(--------) -------------------- N
7041(06-06-86) -------------------- Y
10.2 Arsenic
7060(06-06-86) -------------------- Y
7061(--------) -------------------- N
10.3 Barium
7080(--------) -------------------- N
7081(--------) -------------------- N
10.4 Beryllium
7090(--------) -------------------- N
7091(--------) -------------------- N
10.5 Cadmium
7130(--------) -------------------- N
7131(06-06-86) -------------------- Y
10.6 Chromium, total
7190(--------) -------------------- N
7191(11-30-93) -------------------- Y
10.7 Cobalt
7200(--------) ------------------------ N
7201(--------) ------------------------ N
10.8 Copper
7210(06-06-86) ------------------------ Y
7211(--------) ------------------------ N
10.9 Lead
7420(06-06-86) ------------------------ Y
7421(06-06-86) ------------------------ Y
10.10 Mercury
7470(06-06-86) ------------------------ Y
7471(11-30-93) ------------------------ Y
10.11 Molybdenum
7480(--------) ------------------------ N
7481(11-30-93) ------------------------ Y
10.12 Nickel
7520(06-06-86) ------------------------ Y

CERTIFICATE NUMBER: 1573
EXPIRATION DATE: 7/31/95

10.13 Selenium
7740(06-06-86) -------------------- Y
7741(--------) -------------------- N
10.14 Silver
7760(06-06-86) -------------------- Y
7761(--------) -------------------- N
10.15 Thallium
7840(--------) -------------------- N
7841(06-06-86) -------------------- Y
10.16 Vanadium
7910(--------) -------------------- N
7911(--------) -------------------- N
10.17 Zinc
7950(06-06-86) -------------------- Y
7951(--------) -------------------- N
10.18 Chromium (VI)
7195(--------) -------------------- N
7196(06-06-86) -------------------- Y
7197(--------) -------------------- N
7198(--------) -------------------- N
10.19 Cyanide
9010(06-06-86) ------------------------ Y
10.20 Fluoride
300.0(11-30-93) ---------------------- Y
340.1(--------) ---------------------- N
340.2(06-06-86) ---------------------- Y
340.3(--------) ---------------------- N
10.21 Sulfide
9030(06-06-86) ------------------------ Y
10.22 Total Organic Lead
(--------) ---------------------------- N
10.23 EPA Method 6010(06-06-86) -------------- Y
10.24 EPA Method 6020(11-30-93) -------------- Y

11 Extraction Tests of Hazardous Waste (06-06-86)

11.1 California Waste Extraction Test (WET) (Title 22, CCR, 66261.100, Appendix II) ------------------ Y
11.2 Extraction Procedure Toxicity -- Y
11.3 Toxicity Characteristic Leaching Procedure (TCLP) All Classes ------------------------------ Y
11.4 Toxicity Characteristic Leaching Procedure (TCLP) Inorganics Only --------------------------- N
11.5 Toxicity Characteristic Leaching Procedure (TCLP) Extractables Only ------------------------- N
11.6 Toxicity Characteristic Leaching Procedure (TCLP) Volatiles Only --------------------------- N

12 Organic Chemistry of Hazardous Waste (measurement by GC/MS combination)

12.1 EPA Method 8240(02-05-87) -- Y
12.2 EPA Method 8250(--------) -- N
12.3 EPA method 8270(02-05-87) -- Y
12.4 EPA Method 8280(--------) -- N
12.5 EPA Method 8290(--------) -- N
12.6 EPA Method 8260(11-30-93) -- Y

13 Organic Chemistry of Hazardous Waste (excluding measurements by GC/MS combination)

13.1 EPA Method 8010(--------) ---------- N
13.2 EPA Method 8015(01-09-90) ---------- Y
13.3 EPA Method 8020(06-06-86) ---------- Y
13.4 EPA Method 8030(--------) ---------- N
13.5 EPA Method 8040(--------) ---------- N
13.6 EPA Method 8060(--------) ---------- N
13.7 EPA Method 8080(06-06-86) ---------- Y
13.8 EPA Method 8090(--------) ---------- N
13.9 EPA Method 8100(--------) ---------- N
13.10 EPA Method 8120(--------) ---------- N
13.11 EPA Method 8140(06-06-86) ---------- Y
13.12 EPA Method 8150(06-06-86) ---------- Y
13.13 EPA Method 8310(05-27-92) -------------- Y
13.14 EPA Method 632 (07-15-91) -------------- Y
13.15 Total Petroleum Hydrocarbons
(LUFT Manual) (06-06-86)-------------- Y
13.16 EPA Method 8011(11-08-87) -------------- Y
13.17 EPA Method 8021(--------) -------------- N
13.18 EPA Method 8070(--------) -------------- N
13.19 EPA Method 8110(--------) -------------- N
13.20 EPA Method 8141(11-30-93) -------------- Y
13.21 EPA Method 8330(--------) -------------- N

14 Bulk Asbestos Analysis (--------)

14.1 1% or Greater Asbestos Concentrations (Title 22, CCR, 66261.24(a)(2)(A)) -------------------------N

15 Substances Regulated Under the California Safe Drinking Water and Toxic Enforcement Act (Proposition 65) and Not Included in Other Listed Groups.

16 Wastewater Inorganic Chemistry, Nutrients and Demand (07-15-91)

16.1 Acidity -------------------------- Y
16.2 Alkalinity ----------------------- Y
16.3 Ammonia -------------------------- Y
16.4 Biochemical Oxygen Demand ---------- Y
16.5 Boron ---------------------------- Y
16.6 Bromide -------------------------- Y
16.7 Calcium -------------------------- Y
16.8 cBOD ----------------------------- N
16.9 Chemical Oxygen Demand ------------ Y
16.10 Chloride ------------------------- Y
16.11 Chlorine Residual, total ----------- Y
16.12 Cyanide ------------------------------ Y
16.13 Cyanide amenable to Chlorination ------- Y
16.14 Fluoride ----------------------------- Y
16.15 Hardness ----------------------------- Y
16.16 Kjeldahl Nitrogen -------------------- Y
16.17 Magnesium ---------------------------- Y
16.18 Nitrate ------------------------------ Y
16.19 Nitrite ------------------------------ Y
16.20 Oil and Grease ----------------------- Y
16.21 Organic Carbon ----------------------- Y
16.22 Oxygen, Dissolved -------------------- Y

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16.23 pH ---------------------------------- Y
16.24 Phenols ----------------------------- Y
16.25 Phosphate, ortho- ------------------- Y
16.26 Phosphorus, total ------------------- Y
16.27 Potassium --------------------------- Y
16.28 Residue, Total ---------------------- Y
16.29 Residue, Filterable (TDS) ----------- Y
16.30 Residue, Nonfilterable (TSS) -------- Y
16.31 Residue, Settleable (SS) ------------ Y
16.32 Residue, Volatile ------------------- Y
16.33 Silica ------------------------------ Y
16.34 Sodium ------------------------------ Y
16.35 Specific Conductance ---------------- Y
16.36 Sulfate ----------------------------- Y
16.37 Sulfide (includes total & soluble) - Y
16.38 Sulfite ----------------------------- Y
16.39 Surfactants (MBAS) ------------------ Y
16.40 Tannin and Lignin ------------------- Y
16.41 Turbidity --------------------------- Y
16.42 Iron (Colorimetric Only) ------------ N
16.43 Manganese (Colorimetric Only) ------- N
16.44 Total Recoverable
Petroleum Hydrocarbons ---------------- Y
16.45 Total Organic Halides --------------- Y

17 <u>Toxic Chemical Elements in Wastewater (07-15-91)</u>

17.1 Aluminum ---------------------------- Y
17.2 Antimony ---------------------------- Y
17.3 Arsenic ----------------------------- Y
17.4 Barium ------------------------------ Y
17.5 Beryllium --------------------------- Y
17.6 Cadmium ----------------------------- Y
17.7 Chromium (VI) ----------------------- Y
17.8 Chromium, total --------------------- Y
17.9 Cobalt ------------------------------ Y
17.10 Copper ------------------------------ Y
17.11 Gold -------------------------------- Y
17.12 Iridium ----------------------------- N
17.13 Iron -------------------------------- Y
17.14 Lead -------------------------------- Y
17.15 Manganese --------------------------- Y
17.16 Mercury ----------------------------- Y
17.17 Molybdenum -------------------------- Y
17.18 Nickel ------------------------------ Y
17.19 Osmium ------------------------------ N
17.20 Palladium --------------------------- N
17.21 Platinum ---------------------------- N
17.22 Rhodium ----------------------------- N
17.23 Ruthenium --------------------------- N
17.24 Selenium ---------------------------- Y
17.25 Silver ------------------------------ Y
17.26 Strontium --------------------------- Y
17.27 Thallium ---------------------------- Y
17.28 Tin --------------------------------- Y
17.29 Titanium ---------------------------- Y
17.30 Vanadium ---------------------------- Y
17.31 Zinc -------------------------------- Y
17.32 EPA Method 200.7 -------------------- Y
17.33 EPA Method 200.8 -------------------- Y
17.34 DCP --------------------------------- N
17.35 Asbestos ---------------------------- N

18 <u>Organic Chemistry of Wastewater (measurements by GC/MS combination (07-15-91)</u>

18.1 EPA Method 624 -- Y
18.2 EPA Method 625 -- Y
18.3 EPA Method 1613 --- N
18.4 EPA Method 1625 --- N
18.5 EPA Method 613 -- N

19 <u>Organic Chemistry of Wastewater (excluding measurements by GC/MS combination) (07-15-91)</u>

19.1 EPA Method 601 ---------------------- N
19.2 EPA Method 602 ---------------------- Y
19.3 EPA Method 603 ---------------------- N
19.4 EPA Method 604 ---------------------- N
19.5 EPA Method 605 ---------------------- N
19.6 EPA Method 606 ---------------------- N
19.7 EPA Method 607 ---------------------- N
19.8 EPA Method 608 ---------------------- Y
19.9 EPA Method 609 ---------------------- N
19.10 EPA Method 610 ---------------------- Y
19.11 EPA Method 611 ---------------------- N
19.12 EPA Method 632 ---------------------- Y
19.13 EPA Method 619 ---------------------- N
19.99 EPA Method 615 ---------------------- Y

20 <u>Inorganic Chemistry and Toxic Chemical Elements of Pesticide Residues in Food (--------)</u>

20.1 Processed Foods by One of the Following Methods
Atomic Absorption Spectrophotometry ------------------------------------- N
Inductively Coupled Plasma Atomic Emission Spectrophotometry ------------ N
Inductively Coupled Plasma/Mass Spectrometry ---------------------------- N
Colorimetry --- N
20.2 Raw Commodities by One of the Following Methods
Atomic Absorption Spectrophotometry ------------------------------------- N
Inductively Coupled Plasma Atomic Emission Spectrophotometry ------------ N
Inductively Coupled Plasma/Mass Spectrometry ---------------------------- N
Colorimetric -- N
20.3 Dairy Products by One of the Following Methods
Atomic Absorption Spectrophotometry ------------------------------------- N
Inductively Coupled Plasma Atomic Emission Spectrophotometry ------------ N
Inductively Coupled Plasma/Mass Spectrometry ---------------------------- N
Colorimetry --- N

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20.4 Feed Products by One of the Following Methods
- Atomic Absorption Spectrophotometry ---------- N
- Inductively Coupled Plasma Atomic Emission Spectrophotometry ---------- N
- Inductively Coupled Plasma/Mass Spectrometry ---------- N
- Colorimetry ---------- N

21 <u>Organic Chemistry of Pesticide Residues in Food (measurements by GC/MS) (--------)</u>

21.1 Gas Chromatographic/Mass Spectrometric Methods in Processed Foods ---------- N
21.2 Gas Chromatographic/Mass Spectrometric Methods in Raw Commodities ---------- N
21.3 Gas Chromatographic/Mass Spectrometric Methods in Dairy Products ---------- N
21.4 Gas Chromatographic/Mass Spectrometric Methods in Feed Products ---------- N

22 <u>Organic Chemistry of Pesticide Residues in Food (Excluding Measurement by GC/MS Combination) (--------)</u>

22.1 Halogenated Compounds in Processed Foods by One of the Following Methods
- Gas Chromatography ---------- N
- High Pressure Liquid Chromatography ---------- N
- Liquid Chromatography/Mass Spectrometry ---------- N

22.2 Organophosphorous Compounds in Processed Foods by One of the Following Methods
- Gas Chromatography ---------- N
- High Pressure Liquid Chromatography ---------- N
- Liquid Chromatography/Mass Spectrometry ---------- N

22.3 Carbamates in Processed Foods by One of the Following Methods
- Gas Chromatography ---------- N
- High Pressure Liquid Chromatography ---------- N
- Liquid Chromatography/Mass Spectrometry ---------- N

22.4 Halogenated Compounds in Raw Commodities by One of the Following Methods
- Gas Chromatography ---------- N
- High Pressure Liquid Chromatography ---------- N
- Liquid Chromatography/Mass Spectrometry ---------- N

22.5 Organophosphorous Compounds in Raw Commodities by One of the Following Methods
- Gas Chromatography ---------- N
- High Pressure Liquid Chromatography ---------- N
- Liquid Chromatography/Mass Spectrometry ---------- N

22.6 Carbamates in Raw Commodities by One of the Following Methods
- Gas Chromatography ---------- N
- High Pressure Liquid Chromatography ---------- N
- Liquid Chromatography/Mass Spectrometry ---------- N

22.7 Halogenated Compounds in Dairy Products by One of the Following Methods
- Gas Chromatography ---------- N
- High Pressure Liquid Chromatography ---------- N
- Liquid Chromatography/Mass Spectrometry ---------- N

22.8 Organophosphorous Compounds in Dairy Products by One of the Following Methods
- Gas Chromatography ---------- N
- High Pressure Liquid Chromatography ---------- N
- Liquid Chromatography/Mass Spectrometry ---------- N

22.9 Carbamates in Dairy Products by One of the Following Methods
- Gas Chromatography ---------- N
- High Pressure Liquid Chromatography ---------- N
- Liquid Chromatography/Mass Spectrometry ---------- N

22.10 Halogenated Compounds in Feed Products by One of the Following Methods
- Gas Chromatography ---------- N
- High Pressure Liquid Chromatography ---------- N
- Liquid Chromatography/Mass Spectrometry ---------- N

22.11 Organophosphorous Compounds in Feed Products by One of the Following Methods
- Gas Chromatography ---------- N
- High Pressure Liquid Chromatography ---------- N
- Liquid Chromatography/Mass Spectrometry ---------- N

22.12 Carbamates in Feed Products by One of the Following Methods
- Gas Chromatography ---------- N
- High Pressure Liquid Chromatography ---------- N
- Liquid Chromatography/Mass Spectrometry ---------- N

ENVIRONMENTAL LABORATORY ACCREDITATION/REGISTRATION
List of Approved Fields of Testing and Analytes

FGL Environmental 2500 Stagecoach Road Stockton, CA	TELEPHONE No: (209) 942-0181 CALIFORNIA COUNTY: San Joaquin	CERTIFICATE NUMBER: 1563 EXPIRATION DATE: 07/31/95

1 Microbiology of Drinking Water and Wastewater (07-03-91)

1.1	Total Coliforms in Drinking Water by Multiple Tube Fermentation	Y
1.2	Fecal Coliforms/E. Coli in Drinking Water by MTF	Y
1.3	Total Coliforms in Drinking Water by Membrane Filter Technics	N
1.4	Fecal Coliforms/E. Coli in Drinking Water by Membrane Filter Technics	N
1.5	Total Coliforms and E. Coli in Drinking Water by MMO-MUG	Y
1.6	Total Coliforms in Drinking Water by Clark's Presence/Absence	Y
1.7	Fecal Coliforms/E. Coli in Drinking Water by Clark's Presence/Absence	Y
1.8	Heterotrophic Plate Count	Y
1.9	Total Coliforms in Wastewater by Multiple Tube Fermentation	Y
1.10	Fecal Coliforms in Wastewater by MTF	Y
1.11	Total Coliforms in Wastewater by Membrane Filter Technics	N
1.12	Fecal Coliforms in Wastewater by Membrane Filter Technics	N
1.13	Fecal Streptococci or Enterococci by Multiple Tube Technics	N
1.14	Fecal Streptococci or Enterococci by Membrane Filter Technics	N

2 Inorganic Chemistry and Physical Properties of Drinking Water excluding Toxic Chemical Elements (07-03-91)

2.1	Alkalinity	Y
2.2	Calcium	Y
2.3	Chloride	Y
2.4	Corrosivity	Y
2.5	Fluoride	Y
2.6	Hardness	Y
2.7	Magnesium	Y
2.8	MBAS	Y
2.9	Nitrate	Y
2.10	Nitrite	Y
2.11	Sodium	Y
2.12	Sulfate	Y
2.13	Total Filterable Residue and Conductivity	Y
2.14	Iron (Colorimetric Methods Only)	N
2.15	Manganese (Colorimetric Methods Only)	N
2.16	Phosphate, ortho	Y
2.17	Silica (Colorimetric Methods Only)	Y
2.18	Cyanide	Y

3 Analysis of Toxic Chemical Elements in Drinking Water (07-03-91)

3.1	Arsenic	Y
3.2	Barium	Y
3.3	Cadmium	Y
3.4	Chromium, total	Y
3.5	Copper	Y
3.6	Iron	Y
3.7	Lead	Y
3.8	Manganese	Y
3.9	Mercury	Y
3.10	Selenium	Y
3.11	Silver	Y
3.12	Zinc	Y
3.13	Aluminum	Y
3.14	Asbestos	N
3.15	EPA Method 200.7	Y
3.16	EPA Method 200.8 (Unregulated Elements and Lead Only)	N
3.17	Antimony	Y
3.18	Beryllium	Y
3.19	Nickel	Y
3.20	Thallium	Y

4 Organic Chemistry of Drinking Water (measurement by GC/MS combination) (07-03-91)

4.1	EPA Method 501.3	Y
4.2	EPA Method 524.2	Y
4.3	EPA Method 525	Y
4.4	EPA Method 513	N

5 Organic Chemistry of Drinking Water (excluding measurements by GC/MS combination) (07-03-91)

5.1	EPA Method 501.1	Y
5.2	EPA Method 501.2	Y
5.3	EPA Method 502.1	Y
5.4	EPA Method 502.2	Y
5.5	EPA Method 503.1	Y
5.6	EPA Method 504	Y
5.7	EPA Method 505	Y
5.8	EPA Method 506	N
5.9	EPA Method 507	N
5.10	EPA Method 508	Y
5.11	EPA Method 508A	N
5.12	EPA Method 510.1	Y
5.13	EPA Method 515.1	Y
5.14	EPA Method 531.1	N
5.15	EPA Method 547	N
5.16	EPA Method 548	N
5.17	EPA Method 549	N
5.18	EPA Method 550	N
5.19	EPA Method 550.1	N
5.20	EPA Method 551	N
5.21	EPA Method 552	Y

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6 Radiochemistry (--------)

6.1 Gross Alpha and Beta Radiation ----- N
6.2 Total Radium ---------------------- N
6.3 Radium 226 ------------------------ N
6.4 Uranium --------------------------- N
6.5 Radon 222 ------------------------- N
6.6 Radioactive Cesium ---------------- N
6.7 Iodine 131 ------------------------ N
6.8 Radioactive Strontium ------------- N
6.9 Tritium --------------------------- N
6.10 Gamma and Photon Emitters ---------- N
6.11 Gross Alpha by Co-precipitation --------- N
6.12 Radium 228 ---------------------------- N
6.13 Radioactive Iodine --------------------- N
6.14 Gross Alpha & Beta in Hazardous Wastes -- N
6.15 Alpha Emitting Radium Isotopes in Haz. Wastes ------------------------ N
6.16 Radium 228 in Hazardous Wastes ---------- N

7 Shellfish Sanitation (--------)

7.1 Shellfish meat Microbiology -- N
7.2 Paralytic Shellfish Poison -- N
7.3 Domoic Acid -- N

8 Aquatic Toxicity Bioassays (------)

8.1 Hazardous Waste Aquatic Toxicity Bioassay (Title 22, CCR, 66261.24(a)(6)) ------------------------ N
8.2 Wastewater Testing According to Kopperdahl (1976) using Freshwater Fish. ------------------------ N
8.3 Wastewater Testing According to EPA/600/4-85/013 using Freshwater and/or Marine Organisms --------- N
8.4 Wastewater Testing by EPA Method 1000.0 --- N
8.5 Wastewater Testing by EPA Method 1002.0 --- N
8.6 Wastewater Testing by EPA Method 1003.0 --- N
8.7 Wastewater Testing by EPA Method 1006 --- N
8.8 Wastewater Testing by EPA Method 1007 --- N
8.9 Wastewater Testing by EPA Method 1009 --- N
8.10 Wastewater Testing According to Anderson, et. al. (1990) using Giant Kelp (Macrocystis pyrifera) -- N
8.11 Wastewater Testing According to Anderson, et. al. (1990) using Red Abalone (Haliotus rufescens) --- N
8.12 Wastewater Testing According to Dinnel and Stober (1987) using Purple Sea Urchin (Strongylocentrotus purpuratus) --- N
8.13 Wastewater Testing According to Dinnel and Stober (1987) using Red Sea Urchin (Strongylocentrotus franciscanus) --- N
8.14 Wastewater Testing According to Dinnel and Stober (1987) using Sand Dollar (Dendraster excentricus) --- N
8.15 Wastewater Testing According to procedure E 724-89 (ASTM, 1989) using Pacific Oyster (Crassostrea gigas) --- N
8.16 Wastewater Testing According to procedure E 724-89 (ASTM, 1989) using California Bay Mussel (Mytilus edulis) --- N
8.17 Wastewater Testing According to Standard Methods (APHA, 1989) using an alga (Skeletonema costatum) --- N
8.18 Wastewater Testing According to EPA/600/4-90/027 using Freshwater and/or Marine Organisms --------- N

9 Physical Properties Testing of Hazardous Waste (11-09-93)

9.1 Ignitability by Flashpoint determination (Title 22, CCR, 66261.21) ------------------------------ N
9.2 Corrosivity - pH determination (Title 22, CCR, 66261.22) ------------------------------ Y
9.3 Corrosivity - Corrosivity towards steel (Title 22, CCR, 66261.22) ------------------------------ N
9.4 Reactivity (Title 22, CCR, 66261.23) ------------------------------ Y

10 Inorganic Chemistry and Toxic Chemical Elements of Hazardous Waste

10.1 Antimony
7040(07-03-91) -------------------- Y
7041(07-03-91) -------------------- Y
10.2 Arsenic
7060(07-03-91) -------------------- Y
7061(--------) -------------------- N
10.3 Barium
7080(07-03-91) -------------------- Y
7081(07-03-91) -------------------- Y
10.4 Beryllium
7090(07-03-91) -------------------- Y
7091(07-03-91) -------------------- Y
10.5 Cadmium
7130(07-03-91) -------------------- Y
7131(07-03-91) -------------------- Y
10.6 Chromium, total
7190(07-03-91) -------------------- Y
7191(07-03-91) -------------------- Y
10.7 Cobalt
7200(07-03-91) ------------------------ Y
7201(07-03-91) ------------------------ Y
10.8 Copper
7210(07-03-91) ------------------------ Y
7211(07-03-91) ------------------------ Y
10.9 Lead
7420(07-03-91) ------------------------ Y
7421(07-03-91) ------------------------ Y
10.10 Mercury
7470(07-03-91) ------------------------ Y
7471(07-03-91) ------------------------ Y
10.11 Molybdenum
7480(07-03-91) ------------------------ Y
7481(07-03-91) ------------------------ Y
10.12 Nickel
7520(07-03-91) ------------------------ Y

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10.13 Selenium
7740(07-03-91) -------------------- Y
7741(--------) -------------------- N
10.14 Silver
7760(07-03-91) -------------------- Y
7761(07-03-91) -------------------- Y
10.15 Thallium
7840(07-03-91) -------------------- Y
7841(07-03-91) -------------------- Y
10.16 Vanadium
7910(07-03-91) -------------------- Y
7911(07-03-91) -------------------- Y
10.17 Zinc
7950(07-03-91) -------------------- Y
7951(07-03-91) -------------------- Y
10.18 Chromium (VI)
7195(--------) -------------------- N
7196(07-03-91) -------------------- Y
7197(--------) -------------------- N
7198(--------) -------------------- N
10.19 Cyanide
9010(07-03-91) ----------------------- Y
10.20 Fluoride
300.0(11-09-93) ----------------------- Y
340.1(--------) ----------------------- N
340.2(07-03-91) ----------------------- Y
340.3(--------) ----------------------- N
10.21 Sulfide
9030(07-03-91) ----------------------- Y
10.22 Total Organic Lead
(07-03-91) ----------------------------- Y
10.23 EPA Method 6010(11-09-93) -------------- Y
10.24 EPA Method 6020(--------) -------------- N

11 Extraction Tests of Hazardous Waste (07-03-91)

11.1 California Waste Extraction Test (WET) (Title 22, CCR, 66261.100, Appendix II) ------------------ Y
11.2 Extraction Procedure Toxicity -- Y
11.3 Toxicity Characteristic Leaching Procedure (TCLP) All Classes ---------------------------------- N
11.4 Toxicity Characteristic Leaching Procedure (TCLP) Inorganics Only ------------------------------ N
11.5 Toxicity Characteristic Leaching Procedure (TCLP) Extractables Only ---------------------------- N
11.6 Toxicity Characteristic Leaching Procedure (TCLP) Volatiles Only ------------------------------- N

12 Organic Chemistry of Hazardous Waste (measurement by GC/MS combination)

12.1 EPA Method 8240(11-09-91) -- Y
12.2 EPA Method 8250(--------) -- N
12.3 EPA method 8270(07-03-91) -- Y
12.4 EPA Method 8280(--------) -- N
12.5 EPA Method 8290(--------) -- N
12.6 EPA Method 8260(11-09-93) -- Y

13 Organic Chemistry of Hazardous Waste (excluding measurements by GC/MS combination)

13.1 EPA Method 8010(07-03-91) ---------- Y
13.2 EPA Method 8015(07-03-91) ---------- Y
13.3 EPA Method 8020(07-03-91) ---------- Y
13.4 EPA Method 8030(--------) ---------- N
13.5 EPA Method 8040(07-03-91) ---------- Y
13.6 EPA Method 8060(--------) ---------- N
13.7 EPA Method 8080(07-03-91) ---------- Y
13.8 EPA Method 8090(--------) ---------- N
13.9 EPA Method 8100(--------) ---------- N
13.10 EPA Method 8120(--------) ---------- N
13.11 EPA Method 8140(--------) ---------- N
13.12 EPA Method 8150(07-03-91) ---------- Y
13.13 EPA Method 8310(--------) -------------- N
13.14 EPA Method 632 (--------) -------------- N
13.15 Total Petroleum Hydrocarbons
(LUFT Manual) (07-31-93)-------------- Y
13.16 EPA Method 8011(11-09-93) -------------- Y
13.17 EPA Method 8021(--------) -------------- N
13.18 EPA Method 8070(--------) -------------- N
13.19 EPA Method 8110(--------) -------------- N
13.20 EPA Method 8141(--------) -------------- N
13.21 EPA Method 8330(--------) -------------- N

14 Bulk Asbestos Analysis (--------)

14.1 1% or Greater Asbestos Concentrations (Title 22, CCR, 66261.24(a)(2)(A)) -------------------------N

15 Substances Regulated Under the California Safe Drinking Water and Toxic Enforcement Act (Proposition 65) and Not Included in Other listed Groups.

16 Wastewater Inorganic Chemistry, Nutrients and Demand (07-03-91)

16.1 Acidity --------------------------- Y
16.2 Alkalinity ------------------------ Y
16.3 Ammonia --------------------------- Y
16.4 Biochemical Oxygen Demand ---------- Y
16.5 Boron ----------------------------- Y
16.6 Bromide --------------------------- Y
16.7 Calcium --------------------------- Y
16.8 cBOD ------------------------------ Y
16.9 Chemical Oxygen Demand ------------ Y
16.10 Chloride -------------------------- Y
16.11 Chlorine Residual, total ---------- Y
16.12 Cyanide ----------------------------- Y
16.13 Cyanide amenable to Chlorination ------- Y
16.14 Fluoride ---------------------------- Y
16.15 Hardness ---------------------------- Y
16.16 Kjeldahl Nitrogen -------------------- Y
16.17 Magnesium --------------------------- Y
16.18 Nitrate ----------------------------- Y
16.19 Nitrite ----------------------------- Y
16.20 Oil and Grease ----------------------- Y
16.21 Organic Carbon ----------------------- Y
16.22 Oxygen, Dissolved -------------------- Y

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16.23	pH	Y
16.24	Phenols	Y
16.25	Phosphate, ortho-	Y
16.26	Phosphorus, total	Y
16.27	Potassium	Y
16.28	Residue, Total	Y
16.29	Residue, Filterable (TDS)	Y
16.30	Residue, Nonfilterable (TSS)	Y
16.31	Residue, Settleable (SS)	Y
16.32	Residue, Volatile	Y
16.33	Silica	Y
16.34	Sodium	Y
16.35	Specific Conductance	Y
16.36	Sulfate	Y
16.37	Sulfide (includes total & soluble)	Y
16.38	Sulfite	Y
16.39	Surfactants (MBAS)	Y
16.40	Tannin and Lignin	Y
16.41	Turbidity	Y
16.42	Iron (Colorimetric Only)	Y
16.43	Manganese (Colorimetric Only)	Y
16.44	Total Recoverable Petroleum Hydrocarbons	Y
16.45	Total Organic Halides	N

17 Toxic Chemical Elements in Wastewater (07-03-91)

17.1	Aluminum	Y
17.2	Antimony	Y
17.3	Arsenic	Y
17.4	Barium	Y
17.5	Beryllium	Y
17.6	Cadmium	Y
17.7	Chromium (VI)	Y
17.8	Chromium, total	Y
17.9	Cobalt	Y
17.10	Copper	Y
17.11	Gold	Y
17.12	Iridium	Y
17.13	Iron	Y
17.14	Lead	Y
17.15	Manganese	Y
17.16	Mercury	Y
17.17	Molybdenum	Y
17.18	Nickel	Y
17.19	Osmium	Y
17.20	Palladium	N
17.21	Platinum	N
17.22	Rhodium	N
17.23	Ruthenium	N
17.24	Selenium	Y
17.25	Silver	Y
17.26	Strontium	Y
17.27	Thallium	Y
17.28	Tin	Y
17.29	Titanium	Y
17.30	Vanadium	Y
17.31	Zinc	Y
17.32	EPA Method 200.7	Y
17.33	EPA Method 200.8	N
17.34	DCP	N
17.35	Asbestos	N

18 Organic Chemistry of Wastewater (measurements by GC/MS combination (07-03-91)

18.1	EPA Method 624	Y
18.2	EPA Method 625	Y
18.3	EPA Method 1613	N
18.4	EPA Method 1625	N
18.5	EPA Method 613	N

19 Organic Chemistry of Wastewater (excluding measurements by GC/MS combination) (07-03-91)

19.1	EPA Method 601	Y
19.2	EPA Method 602	Y
19.3	EPA Method 603	Y
19.4	EPA Method 604	Y
19.5	EPA Method 605	N
19.6	EPA Method 606	N
19.7	EPA Method 607	N
19.8	EPA Method 608	Y
19.9	EPA Method 609	N
19.10	EPA Method 610	N
19.11	EPA Method 611	N
19.12	EPA Method 632	N
19.13	EPA Method 619	N
19.99	EPA Method 615	Y

20 Inorganic Chemistry and Toxic Chemical Elements of Pesticide Residues in Food (--------)

20.1	Processed Foods by One of the Following Methods	
	Atomic Absorption Spectrophotometry	N
	Inductively Coupled Plasma Atomic Emission Spectrophotometry	N
	Inductively Coupled Plasma/Mass Spectrometry	N
	Colorimetry	N
20.2	Raw Commodities by One of the Following Methods	
	Atomic Absorption Spectrophotometry	N
	Inductively Coupled Plasma Atomic Emission Spectrophotometry	N
	Inductively Coupled Plasma/Mass Spectrometry	N
	Colorimetric	N
20.3	Dairy Products by One of the Following Methods	
	Atomic Absorption Spectrophotometry	N
	Inductively Coupled Plasma Atomic Emission Spectrophotometry	N
	Inductively Coupled Plasma/Mass Spectrometry	N
	Colorimetry	N

CERTIFICATE NUMBER: 1563
EXPIRATION DATE: 07-31-95

20.4 Feed Products by One of the Following Methods
- Atomic Absorption Spectrophotometry ---------- N
- Inductively Coupled Plasma Atomic Emission Spectrophotometry ---------- N
- Inductively Coupled Plasma/Mass Spectrometry ---------- N
- Colorimetry ---------- N

21 <u>Organic Chemistry of Pesticide Residues in Food (measurements by GC/MS) (--------)</u>

21.1 Gas Chromatographic/Mass Spectrometric Methods in Processed Foods ---------- N
21.2 Gas Chromatographic/Mass Spectrometric Methods in Raw Commodities ---------- N
21.3 Gas Chromatographic/Mass Spectrometric Methods in Dairy Products ---------- N
21.4 Gas Chromatographic/Mass Spectrometric Methods in Feed Products ---------- N

22 <u>Organic Chemistry of Pesticide Residues in Food (Excluding Measurement by GC/MS Combination) (--------)</u>

22.1 Halogenated Compounds in Processed Foods by One of the Following Methods
- Gas Chromatography ---------- N
- High Pressure Liquid Chromatography ---------- N
- Liquid Chromatography/Mass Spectrometry ---------- N

22.2 Organophosphorous Compounds in Processed Foods by One of the Following Methods
- Gas Chromatography ---------- N
- High Pressure Liquid Chromatography ---------- N
- Liquid Chromatography/Mass Spectrometry ---------- N

22.3 Carbamates in Processed Foods by One of the Following Methods
- Gas Chromatography ---------- N
- High Pressure Liquid Chromatography ---------- N
- Liquid Chromatography/Mass Spectrometry ---------- N

22.4 Halogenated Compounds in Raw Commodities by One of the Following Methods
- Gas Chromatography ---------- N
- High Pressure Liquid Chromatography ---------- N
- Liquid Chromatography/Mass Spectrometry ---------- N

22.5 Organophosphorous Compounds in Raw Commodities by One of the Following Methods
- Gas Chromatography ---------- N
- High Pressure Liquid Chromatography ---------- N
- Liquid Chromatography/Mass Spectrometry ---------- N

22.6 Carbamates in Raw Commodities by One of the Following Methods
- Gas Chromatography ---------- N
- High Pressure Liquid Chromatography ---------- N
- Liquid Chromatography/Mass Spectrometry ---------- N

22.7 Halogenated Compounds in Dairy Products by One of the Following Methods
- Gas Chromatography ---------- N
- High Pressure Liquid Chromatography ---------- N
- Liquid Chromatography/Mass Spectrometry ---------- N

22.8 Organophosphorous Compounds in Dairy Products by One of the Following Methods
- Gas Chromatography ---------- N
- High Pressure Liquid Chromatography ---------- N
- Liquid Chromatography/Mass Spectrometry ---------- N

22.9 Carbamates in Dairy Products by One of the Following Methods
- Gas Chromatography ---------- N
- High Pressure Liquid Chromatography ---------- N
- Liquid Chromatography/Mass Spectrometry ---------- N

22.10 Halogenated Compounds in Feed Products by One of the Following Methods
- Gas Chromatography ---------- N
- High Pressure Liquid Chromatography ---------- N
- Liquid Chromatography/Mass Spectrometry ---------- N

22.11 Organophosphorous Compounds in Feed Products by One of the Following Methods
- Gas Chromatography ---------- N
- High Pressure Liquid Chromatography ---------- N
- Liquid Chromatography/Mass Spectrometry ---------- N

22.12 Carbamates in Feed Products by One of the Following Methods
- Gas Chromatography ---------- N
- High Pressure Liquid Chromatography ---------- N
- Liquid Chromatography/Mass Spectrometry ---------- N

Performance and System Audits

Figure 12-4 FGL Santa Paula - NV DHR Certification

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BOB MILLER
Governor

SCOTT M. CRAIGIE
Director

YVONNE SYLVA
Administrator

DONALD S. KWALICK, MD, MPH
State Health Officer

STATE OF NEVADA

DEPARTMENT OF HUMAN RESOURCES

HEALTH DIVISION

BUREAU OF LABORATORY SERVICES

FGL ENVIRONMENTAL, INC.   CA140
853 CORPORATION STREET
SANTA PAULA, CA 93061

CONTACT   KURT WILKINSON

PHONE   (805) 659-0910

Pursuant to regulations adopted by the State Board of Health, the State of Nevada will accept data from this laboratory for the following contaminants under the Safe Drinking Water Act based performance evaluation sample results from EMSL-LV radiochemistry and the following studies:

WS032   WP030
WS033   WP031

THIS CERTIFICATE IS EFFECTIVE THRU OCTOBER, 1994, OR UNTIL WP032 AND WS034 ARE EVALUATED.

INORGANICS		ORGANICS		RADIOCHEMISTRY
PRIMARY	SECONDARY	ALACHLOR	* TRIHALOMETHANES (THMs)	GROSS ALPHA
		ATRAZINE		GROSS BETA
ANTIMONY	pH	CHLORODANE	VOLATILE ORGANIC	RADIUM-226
ARSENIC	SPEC. COND.	ENDRIN	COMPOUNDS (VOCs)	RADIUM-228
BARIUM		HEPTACHLOR	INCLUDING	
BERYLLIUM	HARDNESS	HEPTACHLOR EPOXIDE	VINYL CHLORIDE	URANIUM
CADMIUM	CALCIUM	HEXACHLOROBENZENE		
CHROMIUM	MAGNESIUM	HEXACHLOROCYCLOPENTADIENE		
COPPER	SODIUM	LINDANE		
LEAD	POTASSIUM	METHOXYCHLOR	ETHYLENE DIBROMIDE (EDB)	
MERCURY		SIMAZINE	DIBROMOCHLOROPROPANE (DB	
NICKEL	CHLORIDE	TOXAPHENE		
SELENIUM	SULFATE		DECACHLOROBIPHENYL	
SILVER	IRON	2,4-D		
THALLIUM	MANGANESE	2,4,5-TP	BENZO(A)PYRENE	
NITRATE-N	ZINC	DALAPON	BIS(2-ETHYLHEXYL)ADIPATE	
NITRITE-N		DINOSEB	BIS(2-ETHYLHEXYL)PHTHALA	
FLUORIDE		PENTACHLOROPHENOL	* DIQUAT	
		PICLORAM	ENDOTHALL	
RES CHLORINE			GLYPHOSATE	
TURBIDITY		* ALDICARB		
TOTAL CYANIDE		ALDICARB SULFONE		
		ALDICARB SULFOXIDE		
		CARBOFURAN		
LAST ON-SITE		OXAMYL (VYDATE)		

* PROVISIONAL ACCEPTANCE

3-30-94

CHEMISTRY CERTIFICATION OFFICER   DATE

Laurence Wilson   3-30-94

LABORATORY CERTIFICATION OFFICER   DATE

PAID NSHL
FY 1994

L. H. DODGION
Administrator

STATE OF NEVADA
BOB MILLER
Governor

PETER G. MORROS
Director

Administration	(702) 687-4670
Air Quality	687-5065
Mining Regulation and Reclamation	687-4675
Water Quality Planning	687-5883
Water Pollution Control	687-5870
Fax	687-5856

Waste Management	687-5872
Chemical Hazards Management	687-5872
Federal Facilities	687-5872
Fax	885-0868

DEPARTMENT OF CONSERVATION AND NATURAL RESOURCES

DIVISION OF ENVIRONMENTAL PROTECTION

Capitol Complex
333 W. Nye Lane
Carson City, Nevada 89710

FGL ENVIRONMENTAL, INC. CA140
853 CORPORATION STREET
SANTA PAULA, CA 93061

CONTACT KURT WILKINSON
PHONE (805) 659-0910

Pursuant to regulations adopted by the State Environmental Commission, the State of Nevada will accept data from this laboratory for the following contaminants under the Clean Water Act based performance evaluation sample results from the following studies:

WP030
WP031

THIS CERTIFICATE IS EFFECTIVE THRU SEPTEMBER, 1994, OR UNTIL WP032 IS EVALUATED.

MINERAL	NUTRIENTS	METALS	DEMANDS	ORGANICS	MISCELLANEOUS
pH	* AMMONIA-N	ALUMINUM			CYANIDE
SPEC. COND.	NITRATE	ARSENIC	TOC	PCBs IN OIL	TSS (NFR)
	ORTHO-P	BERYLLIUM	* 5-DAY BOD	PESTICIDES	* OIL & GREASE
HARDNESS	KJELDAHL-N	CADMIUM		VOLATILE HALOCARBONS	
CALCIUM	TOTAL-P	COBALT		VOLATILE AROMATICS	
MAGNESIUM		CHROMIUM			
SODIUM		COPPER			
POTASSIUM		IRON			
		MERCURY			
CHLORIDE		MANGANESE			
FLUORIDE		NICKEL			
SULFATE		LEAD			
		SELENIUM			
		VANADIUM			
		ZINC			
		ANTIMONY			
		SILVER			
		THALLIUM			
		* MOLYBDENUM			
		STRONTIUM			

LAST ON-SITE

* PROVISIONAL ACCEPTANCE

Recommended: 3-24-94
Date

Approved: 3/25/94
Date

Robert J. Vicks
Chemistry Certification Officer

James J. Cooper
Quality Assurance Officer

Performance and System Audits

Figure 12-5 FGL Santa Paula - OR OHD Certification

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OREGON HEALTH DIVISION
DRINKING WATER LABORATORY CERTIFICATION

10/28/1994 List of Approved Analytes and Methods 07:19:52

LAB NAME: FGL ENVIRONMENTAL, INC.
ADDRESS: 853 CORPORATION STREET
SANTA PAULA, CA 93060

PHONE #: (805)659-0910 FAX # : (805)525-4172

LAB #: CA140

ISSUE DATE : 10/28/1994
EXPIRATION DATE : 06/30/1995
(or until List is reissued)

1. Inorganic Chemistry		Method	Alt Method
1.01 Antimony	APPROVED	200.8	
1.02 Arsenic	APPROVED	206.2	
1.03 Asbestos	NOT APPROVED		
1.04 Barium	APPROVED	200.7	
1.05 Beryllium	APPROVED	200.8	
1.06 Cadmium	APPROVED	213.2	
1.07 Chromium	APPROVED	218.2	
1.08 Copper	APPROVED	200.8	
1.09 Cyanide	APPROVED	335.2	
1.10 Fluoride	APPROVED	340.2	
1.11 Lead	APPROVED	200.8	
1.12 Mercury	APPROVED	245.2	
1.13 Nickel	APPROVED	200.8	
1.14 Nitrate	APPROVED	300.0	
1.15 Nitrite	APPROVED	300.0	
1.16 Selenium	APPROVED	270.2	
1.17 Thallium	APPROVED	200.8	

2. Microbiology

2.01 Fecal Coliforms by EC	NOT APPROVED	
2.02 E. coli by EC + MUG	NOT APPROVED	
2.03 Heterotrophic Plate Count	NOT APPROVED	
2.04 Total Coliforms by Membrane Filter Method	NOT APPROVED	
2.05 Total Coliforms/E. coli by MMO-MUG	NOT APPROVED	
2.06 Total Coliforms by Multiple Tube Fermentation	NOT APPROVED	
2.07 N Agar + MUG	NOT APPROVED	
2.08 Total Coliforms by Presence/Absence Medium Method	NOT APPROVED	

3. Organic Chemistry - Part I

3.01 Adipates as di(ethylhexyl)adipate	APPROVED	525.1
3.02 Dibromochloropropane (DBCP)	APPROVED	504
3.03 TCDD (Dioxin)	NOT APPROVED	
3.04 Ethylene Dibromide (EDB)	APPROVED	504
3.05 PAHs as benzo(a)pyrene	APPROVED	550
3.06 Total Polychlorinated Biphenyls (PCBs)	APPROVED	508A
3.07 Phthalates as di(ethylhexyl)phthalate	APPROVED	525.1
3.08 Total Trihalomethanes (TTHMs)	PROVISIONAL	501.2
3.09 Vinyl Chloride (VCs)	APPROVED	524.2
3.10 Volatile Organic Compounds (VOCs)	APPROVED	524.2

LAB NAME: FGL ENVIRONMENTAL, INC. LAB #: CA140
ADDRESS: 853 CORPORATION STREET
SANTA PAULA, CA 93060

ISSUE DATE : 10/28/1994
EXPIRATION DATE : 06/30/1995
(or until List is reissued)

PHONE #: (805)659-0910 FAX # : (805)525-4172

4. Organic Chemistry - Part II

		Method	Alt Method
4.01 2,4,5-TP (Silvex)	APPROVED	515.1	
4.02 2,4-D	APPROVED	515.1	
4.03 Alachlor	APPROVED	505	
4.04 Atrazine	APPROVED	507	
4.05 Carbofuran	APPROVED	531.1	
4.06 Chlordane	APPROVED	505	
4.07 Dalapon	APPROVED	515.1	
4.08 Dinoseb	APPROVED	515.1	
4.09 Diquat	APPROVED	549	
4.10 Endothall	APPROVED	548	
4.11 Endrin	APPROVED	505	
4.12 Glyphosate	APPROVED	547	
4.13 Heptachlor	APPROVED	505	
4.14 Heptachlor epoxide	APPROVED	505	
4.15 Hexachlorobenzene	APPROVED	505	
4.16 Hexachlorocyclopentadiene	APPROVED	525.1	
4.17 Lindane	APPROVED	505	
4.18 Methoxychlor	APPROVED	505	
4.19 Oxamyl (Vydate)	APPROVED	531.1	
4.20 Pentachlorophenol	APPROVED	515.1	
4.21 Picloram	APPROVED	515.1	
4.22 Simazine	APPROVED	507	
4.23 Toxaphene	APPROVED	505	

5. Radiochemistry

5.01 Gross alpha	APPROVED
5.02 Gross beta	APPROVED
5.03 Iodine-131	NOT APPROVED
5.04 Radium-226	APPROVED
5.05 Radium-228	APPROVED
5.06 Strontium-90	NOT APPROVED
5.07 Tritium	NOT APPROVED

Preventive Maintenance

13.1 Maintenance and Repair of Instruments

Routine maintenance of equipment is performed by the analyst when appropriate. The department supervisor must be notified immediately if any sign of serious malfunction occurs in any instrument so that he can decide if a qualified serviceman should be consulted. If warranted, instrument repair and calibration is performed by qualified service technicians (usually service representatives of the instrument manufacturer). A record containing the date, the nature of the problem, description of the repair, and the name of the technician is also kept.

13.2 Good Laboratory Practices

Good laboratory practices are followed to prevent contamination of samples and standards. This includes the careful cleaning of glassware, and the use of disposable labware and containers when practical. Sample containers are monitored for contamination when received, according to lot number and proposed use.

The bacteriology water is monitored for suitability. Standard plate count, electrical conductivity and residual chlorine are checked monthly. Heavy metals (including lead, cadmium, chromium, copper, nickel and zinc) are checked annually.

Specific Routine Procedures used to assess Data Precision, Accuracy, and Completeness

Before analytical data can be used, it is necessary to determine the suitability of the data for a given purpose. The characteristics used to determine data suitability are precision, accuracy, and completeness. FGL Environmental deterimines these characteristics by using specific procedures, which are detailed in the following sections.

14.1 Precision

Precision is the measure of how closely replicate analyses agree. FGL Environmental uses Relative Percent Difference (RPD) to measure between duplicate analyses.

Precision is monitored for nearly all methods by RPD's plotted on control charts. The mean RPD +/- 2 standard deviations are the warning limits, and the mean RPD +/- 3 standard deviation are the control limits. To assess precision, FGL Environmental uses the following on a regular basis:

(1) Duplicate samples
(2) Duplicate Matrix Spikes
(3) Control Charts

14.1.1 Precision Calculation

The RPD of duplicate samples is an absolute value from the following calculation:

$$\frac{(\text{First Sample Value} - \text{Second Sample Value}) \times 100}{(\text{First Sample Value} + \text{Second Sample Value}) / 2}$$

14.2 Accuracy

Accuracy measures the deviation of the analytical value from the "true" or known value. The true value for field samples are never known, so accuracy measurements are made on the analysis of QC samples analyzed with field samples.

Accuracy is monitored for nearly all methods by percent recoveries plotted on control charts. The mean recovery +/- 2 standard deviation are the warning limits, and the mean recovery +/- 3 standard deviation are the control limits. To assess accuracy, FGL Environmental uses the following on a regular basis:

(1) Laboratory Control Samples
(2) Matrix Spikes
(3) Matrix Spike Duplicates
(4) Surrogate Spikes
(5) Control Charts

14.2.1 Accuracy Calculations

Percent recoveries are calculated as follows (identical units would be used through each calculation):

Laboratory control sample percent recoveries:

$$\frac{\text{value found} \times 100}{\text{true value}}$$

Specific Routine Procedures used to assess Data Precision, Accuracy, and Completeness

14.2.1 Accuracy Calculations continued

Spike percent recoveries:

$$\frac{(\text{spiked sample result - sample result}) \text{ X } 100}{\text{spike amount added}}$$

14.3 Completeness

Completeness is defined by QAMS-005/80 as - a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under correct normal conditions.

By this definition the influence of the laboratory on completeness involves three areas: appropriate sample handling and storage, conformance to holding time requirements and data validity as measured by meeting acceptance criteria for the quality control parameters. We do not track completeness as a measurable form at this point. We do strive to provide data packages that are 100% complete and give explanations when there are deficiencies.

Corrective Actions

Corrective actions are necessary when trends of more than one out-of- control situations occur. Corrective action reports are used to document the corrections made. Corrective actions are not normally used in isolated out-of-control situations that have routine explanations as the data in these situations must be resolved before continuing and reporting analyses.

15.1 Corrective Action Reports

Each work area has a corrective action report logbook. When corrective actions are necessary, a corrective action report form (figure 15-1) is filled out identifying the analyst, date, method, client and lab number (if applicable), QA batch number (if applicable) problems encountered, investigation and proposed corrective actions. After implementing the actions another entry is required to verify that the problem was solved. This process may need to be repeated in some situations. The reports are on record and will be included in a project data package if that is required by the project plan. An example of a corrective action report form is shown in figure 15-1.

Corrective Actions

Figure 15-1 Corrective Action Report Form

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Corrective Actions

Corrective Action Report Form

Method: ______________________________

Problem Assigned To: ______________________________

Problem encountered: ____

____

____

____

____

____

Cause of the problem: ____

____

____

____

____

____

Corrective action: ____

____

____

____

____

Closure of Investigation:

Performed by: ____________________ Date: __________________________

Verified by: ____________________ Date: __________________________

Quality Assurance Reports to Management

In order to insure that the Quality Assurance program at the lab maintains a high profile, there are several mechanisms in place which insure the QA information is routinely conveyed to laboratory management. This includes a formal monthly QA inspection summary report, reports on internal and external PE samples and summary reports for external system audits.

16.1 Monthly QA Inspection Summary Reports

The QA Director or Officer prepares a report to all managers on a monthly basis. This is a two section report containing the following details:

(1) All uncompleted non-conformance items, the manager responsible for resolving the item, and date found.
(2) All completed non-conformance items, the manager responsible and the date resolved.

This provides a historical record of progress in quality control and tracks non-conformance items that have not been resolved. This helps management prioritize on going non-conformance items.

16.2 Performance Evaluation Failure Reports

Evaluations of any failures on external PE samples are outlined by department supervisors and prepared by the QA Director or Officer for certifying agencies. Copies are given to the department supervisors and Lab Director.

16.3 External System Audit Summary Reports

After debriefing by the auditors a summary report is prepared by the QA Director or Officer for the supervisors and Lab Director. Rather than waiting for an audit report, this initiates corrective actions for any non-conformance items promptly.

Quality Assurance Reports to Management

Figure 16-1 FGL QA Inspection Summary Report Form

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Quality Assurance Reports to Management

FGL QC Inspection Non-Comformance Summary Report

Current Non-conformance Items

Non-Comformance Item	Person Resp.	Date Found

Corrected Non-comformance Items

Non-Comformance Item	Person Resp.	Date Found	Date Comp.

Equipment List

FGL is dedicated to having state-of-the-art equipment throughout thelaboratory. The top quality equipment is essential to providing reliable data. Autosamplers are used when available and appropriate to increase throughput. The following is a list of equipment:

Organics

5 GCMS's -
- 1 HP 5890II/5972 with 7673A autosampler
- 1 HP 5890II/5972 with LSC3000/ALS2016 autosampler
- 1 HP 5890II/5971A with 7673A autosampler
- 1 HP 5890/5970 with 7673A autosampler
- 1 Finnigan XL 50 with LSC2000/ALS2032 autosampler

9 GC's -
- 2 HP 5890 with ECD + ECD detectors and 7673A autosampler
- 1 HP 5890 with NPD + NPD detectors and 7673A autosampler
- 1 HP 5890 with NPD + FPD detectors and 7673A autosampler
- 1 HP 5890 with PID detector and LSC2000/ALS2016 autosampler
- 1 HP 5890 with FID detector and LSC2000/ALS2016 autosampler
- 1 HP 5890 with FID detector
- 1 HP 5890 with ELCD + ELCD detectors
- 1 Varian 3700 with ECD + ECD detectors
- 1 Varian 3700 with ECD + FPD + FID detectors

2 HPLC's -
- 1 HP 1090 with UV and fluorescence detectors and postcolumn derivatization
- 1 Hitachi system with diode array and fluorescence detectors

2 IR's -
- 1 Perkin-Elmer 700
- 1 Foxboro Miran 1FF

1 TOX -
- 1 MCI TOX 10

1 TOC -
- 1 ASTRO 2001

Inorganics

1 ICP/MS -
- Fisons PlasmaQuad 2

2 ICP's -
- 1 ARL 3410 with model 101 autosampler
- 1 Thermo-Jarrell Ash Atomscan 25

2 Graphite Furnaces with Zeeman-AA -
- 1 Perkin-Elmer 5100Z with AS-60 autosampler
- 1 Hitachi Z-8100

Equipment List

Inorganics continued

2 Flame AA's -
2 Perkin-Elmer 5000

2 Microwave Digesters -
2 CEM - MDS 2100 Microwave Digester

2 IC's -
2 Dionex 300 - Ion Chromatograph and Spectraphysics AS3500 autosampler

3 Autoanalyzer's -
3 Technicon AA2 autoanalyzer

3 UV/VIS Spectrophotometer's -
1 Perkin-Elmer Lambda 3
1 Beckman model 24

2 Nephelometers (turbidimeters) -
2 Seqouia-Turner model 690

Radioactivity

1 Gamma ray spectroscope -
1 Princeton Gamma Tech

1 Gas scintillation -
1 Radom 5C-5

1 Liquid scintillation autoanalyzer -
1 Packard 2500TR

8 Proportional counter's -
5 NMC PCC11T Alpha counters
2 Tennelec LB 1000 Alpha/Beta counters
1 Tennelec LB 5100 Alpha/Beta counter with autosampler

Microbiology

3 Incubators
3 Autoclaves

Field Services

11 Field vehicles
8 Isco composite autosamplers

LIMS capabilities

3 Microvax with PCSA pathworks fileserver and Dbase IV
80 DOS/OS2/Windows based computers

FGL

Corporate Offices & Laboratory
P.O. Box 272/853 Corporation Street
Santa Paula, CA 93061-0272
TEL: (805) 659-0910
FAX: (805) 5254172

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95205
TEL: (209) 942-0181
FAX: (209) 942-0423

Field Office
Visalia, California
TEL: (209) 734-9473
FAX: (209) 734-8435
Mobile: (209) 737-2399

APPENDIX F

BLANK, DUPLICATE, AND SPIKE SAMPLE ANALYTICAL REPORTS

July 18, 1996

LAB No: SP 605186-1

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Organic Analysis
Matrix: Monitoring Well

Project/Site: MW5-1A Quarterly Sampling Area 317
Sample Description: MW5/B/31/1A
Sampled by : Abdun-Nur/Bricker
Container : Amber Glass TFE-Cap
Preservatives: H2SO4 pH < 2

Sampled : June 26, 1996
Received : June 26, 1996
Extracted : N/A
Analyzed : July 2, 1996
QA/QC ID# : SP 96070200A A

TOTAL ORGANIC CARBON

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOC	415.1	mg/L	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)
mg/L = Milligrams Per Liter (ppm) ND = Not Detected at or above the DLR.
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

See attached for Quality Assurance report. If you have any questions, please call.

FGL ENVIRONMENTAL

Kelly A. Dunnahoo, B.S.
Organic Laboratory Manager

for D.H.N.
Darrell H. Nelson, B.S.
Laboratory Director

KAD/DHN:kdm

ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996

LAB No: SP 605186-2

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Organic Analysis
Matrix: Monitoring Well

Project/Site: MW5-1A Quarterly Sampling Area 317
Sample Description: MW5/C/31/1A
Sampled by : Abdun-Nur/Bricker
Container : Amber Glass TFE-Cap
Preservatives: H2SO4 pH < 2

Sampled : June 26, 1996
Received : June 26, 1996
Extracted : N/A
Analyzed : July 2, 1996
QA/QC ID# : SP 96070200A A

TOTAL ORGANIC HALOGENS

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOX	9020	ug/L	5	ND	5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)
ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

See attached for Quality Assurance report. If you have any questions, please call.

FGL ENVIRONMENTAL

Kelly A. Dunnahoo, B.S.
Organic Laboratory Manager

for D.H.N.
Darrell H. Nelson, B.S.
Laboratory Director

KAD/DHN:kdm

FGL ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996

LAB No: SP 605186-3

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Organic Analysis
Matrix: Monitoring Well

Project/Site: MW5-1A Quarterly Sampling Area 317
Sample Description: MW5/O/31/1A
Sampled by : Abdun-Nur/Bricker
Container : VOA
Preservatives:

Sampled : June 26, 1996
Received : June 26, 1996
Extracted : N/A
Analyzed : July 2, 1996
QA/QC ID# : SP 96070201H A

EPA METHOD 624

CONSTITUENT	SAMPLE DLR ug/L	SAMPLE RESULTS ug/L	LAB DLR ug/L	BLANK RESULTS ug/L
Trichloroethylene	0.5	ND	0.5	ND

SURROGATES	SAMPLE AR	SAMPLE % REC.	LAB BLANK AR	LAB BLANK % REC.
1,2-Dichloroethane-d4	40-140	99	40-140	94
Toluene-d8	64-139	98	64-139	95
BFB	50-149	89	50-149	86

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)
ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR. AR = Acceptable Range
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

See attached for Quality Assurance report. If you have any questions, please call.

FGL ENVIRONMENTAL

Kelly A. Dunnahoo, B.S.
Organic Laboratory Manager

[signature] for D.H.N.
Darrell H. Nelson, B.S.
Laboratory Director

KAD/DHN:kdm

FGL ENVIRONMENTAL

Analytical Chemists

July 18, 1996

ORGANIC Quality Assurance Report for sample: 605186

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

Constituent	BATCH ID	EPA Method	Units	CALIBRATION QA/QC Type	Conc.	% REC	AR	NOTE	METHOD QA/QC Type	Conc.	% REC	% REC	AR	% DIF	MAV	NOTE
1,2-Dichloroethane-d4	OH10A	624	ug/L	LCS	10.0	93.7	40-140		BS	10.0	93.4	94.7	40-140	1.4	30.0	
Toluene-d8	OH10A	624	ug/L	LCS	10.0	96.3	64-139		BS	10.0	95.3	95.2	64-139	0.1	30.0	
BFB	OH10A	624	ug/L	LCS	10.0	90.6	50-149		BS	10.0	87.0	85.9	50-149	1.3	30.0	
Trichloroethylene	OH10A	624	ug/L	LCS	10.0	86.2	37-151		BS	10.0	93.4	96.8	37-151	3.5	23.0	
TOC	OA 2A	415.1	mg/L	LCS	50.0	98.0	75-125		MS	50.0	112	106	75-125	5.5	20.0	
TOX	OA 2A	TOX	ug/L	CCV	10.0	100	74-116		MS	100	123	3150	75-125	185	20.0	105

FGL ID = 19960702 N/A => Not Applicable NOTE => See note indicated below.

Notes:
105 Lab error determined to be the cause. The problem was identified and does not affect the samples. Batch qualified by LCS, and/or CCV.

FGL ENVIRONMENTAL, INC.

KAD/DHN:kdm

Kurt Wilkinson, B.S., QA Director

Corporate Offices & Laboratory
P.O. Box 272 / 853 Corporation Street
Santa Paula, CA 93061-0272

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215

Field Office
Visalia, California
TEL: (209) 734-9473

ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996

LAB No: SP 605187-1

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Organic Analysis
Matrix: Monitoring Well

Project/Site: MW6-1A Quarterly Sampling Area 317
Sample Description: MW6/B/31/1A
Sampled by : Abdun-Nur/Bricker
Container : Amber Glass TFE-Cap
Preservatives: H2SO4 pH < 2

Sampled : June 26, 1996
Received : June 26, 1996
Extracted : N/A
Analyzed : July 2, 1996
QA/QC ID# : SP 96070200A A

TOTAL ORGANIC CARBON

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOC	415.1	mg/L	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)
mg/L = Milligrams Per Liter (ppm) ND = Not Detected at or above the DLR.
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

See attached for Quality Assurance report. If you have any questions, please call.

FGL ENVIRONMENTAL

Kelly A. Dunnahoo, B.S.
Organic Laboratory Manager

for D.H.N.
Darrell H. Nelson, B.S.
Laboratory Director

KAD/DHN:kdm

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Visalia, CA
TEL: 209/734-9473
FAX: 209/734-8435

FGL ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996

LAB No: SP 605187-2

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Organic Analysis
Matrix: Monitoring Well

Project/Site: MW6-1A Quarterly Sampling Area 317
Sample Description: MW6/C/31/1A
Sampled by : Abdun-Nur/Bricker
Container : Amber Glass TFE-Cap
Preservatives: H_2SO_4 pH < 2

Sampled : June 26, 1996
Received : June 26, 1996
Extracted : N/A
Analyzed : July 2, 1996
QA/QC ID# : SP 96070200A A

TOTAL ORGANIC HALOGENS

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOX	9020	ug/L	5	ND	5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)
ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

See attached for Quality Assurance report. If you have any questions, please call.

FGL ENVIRONMENTAL

Kelly A. Dunnahoo, B.S.
Organic Laboratory Manager

for D.H.N.
Darrell H. Nelson, B.S.
Laboratory Director

KAD/DHN:kdm

FGL ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996

LAB No: SP 605187-3

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Organic Analysis
Matrix: Monitoring Well

Project/Site: MW6-1A Quarterly Sampling Area 317
Sample Description: MW6/0/31/1A
Sampled by : Abdun-Nur/Bricker
Container : VOA
Preservatives:

Sampled : June 26, 1996
Received : June 26, 1996
Extracted : N/A
Analyzed : July 2, 1996
QA/QC ID# : SP 96070201H A

EPA METHOD 624

CONSTITUENT	SAMPLE DLR ug/L	SAMPLE RESULTS ug/L	LAB DLR ug/L	BLANK RESULTS ug/L
Trichloroethylene	0.5	ND	0.5	ND

SURROGATES	SAMPLE AR	SAMPLE % REC.	LAB BLANK AR	LAB BLANK % REC.
1,2-Dichloroethane-d4	40-140	98	40-140	94
Toluene-d8	64-139	98	64-139	95
BFB	50-149	89	50-149	86

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)
ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR. AR = Acceptable Range
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

If you have any questions, please call.

FGL ENVIRONMENTAL

Kelly A. Dunnahoo, B.S.
Organic Laboratory Manager

[signature] for D.H.N.

Darrell H. Nelson, B.S.
Laboratory Director

KAD/DHN:kdm

FGL ENVIRONMENTAL

Analytical Chemists

July 18, 1996 ORGANIC Quality Assurance Report for sample: 605187

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

Constituent	BATCH ID	EPA Method	Units	CALIBRATION QA/QC Type	Conc.	% REC	AR	NOTE	METHOD QA/QC Type	Conc.	% REC	% REC	AR	% DIF	MAV	NOTE
1,2-Dichloroethane-d4	0H10A	624	ug/L	LCS	10.0	93.7	40-140		BS	10.0	93.4	94.7	40-140	1.4	30.0	
Toluene-d8	0H10A	624	ug/L	LCS	10.0	96.3	64-139		BS	10.0	95.3	95.2	64-139	0.1	30.0	
BFB	0H10A	624	ug/L	LCS	10.0	90.6	50-149		BS	10.0	87.0	85.9	50-149	1.3	30.0	
Trichloroethylene	0H10A	624	ug/L	LCS	10.0	86.2	37-151		BS	10.0	93.4	96.8	37-151	3.5	23.0	
TOC	0A 2A	415.1	mg/L	LCS	50.0	98.0	75-125		MS	50.0	112	106	75-125	5.5	20.0	
TOX	0A 2A	TOX	ug/L	CCV	10.0	100	74-116		MS	100	123	3150	75-125	185	20.0	105

FGL ID = 19960702   N/A => Not Applicable   NOTE => See note indicated below.

Notes:
105 Lab error determined to be the cause. The problem was identified and does not affect the samples. Batch qualified by LCS, and/or CCV.

FGL ENVIRONMENTAL, INC.

KAD/DHN:kdm

Kurt Wilkinson, B.S., QA Director

APPENDIX G

ANALYTICAL REPORTS FOR GROUND WATER MONITORING PARAMETERS

ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996

LAB No: SP 605182-1

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Inorganic Analysis

Sample Site: MW1 Quarterly Sampling Area 317
Description: MW1/A/31
Sampled by : Abdun-Nur/Bricker
Type of Sample: Monitoring Well

Sampled : June 26, 1996
Received : June 26, 1996
Completed : July 1, 1996
QA/QC ID# : 60518201-

Analytical Results

CONSTITUENT	METHOD	UNITS	DLR	RESULTS
Conductivity	2510B	umhos/cm2	1	760
pH	4500-H B	units	---	7.7

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR.
ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.
Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Yee Ren, M.S.
Environmental Chemist

Darrell H. Nelson, B.S.
Laboratory Director

YR/DHN:kdm

ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996

LAB No: SP 605182-2

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Organic Analysis
Matrix: Monitoring Well

Project/Site: MW1 Quarterly Sampling Area 317
Sample Description: MW1/B/31
Sampled by : Abdun-Nur/Bricker
Container : Amber Glass TFE-Cap
Preservatives: H2SO4 pH < 2

Sampled : June 26, 1996
Received : June 26, 1996
Extracted : N/A
Analyzed : July 2, 1996
QA/QC ID# : SP 96070200A A

TOTAL ORGANIC CARBON

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOC	415.1	mg/L	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)
mg/L = Milligrams Per Liter (ppm) ND = Not Detected at or above the DLR.
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

See attached for Quality Assurance report. If you have any questions, please call.

FGL ENVIRONMENTAL

Kelly A. Dunnahoo, B.S.
Organic Laboratory Manager

for D.H.N.
Darrell H. Nelson, B.S.
Laboratory Director

KAD/DHN:kdm

ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996

LAB No: SP 605182-3

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Organic Analysis
Matrix: Monitoring Well

Project/Site: MW1 Quarterly Sampling Area 317
Sample Description: MW1/C/31
Sampled by : Abdun-Nur/Bricker
Container : Amber Glass TFE-Cap
Preservatives: H2SO4 pH < 2

Sampled : June 26, 1996
Received : June 26, 1996
Extracted : N/A
Analyzed : July 2, 1996
QA/QC ID# : SP 96070200A A

TOTAL ORGANIC HALOGENS

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOX	9020	ug/L	5	ND	5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)
ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

See attached for Quality Assurance report. If you have any questions, please call.

FGL ENVIRONMENTAL

Kelly A. Dunnahoo, B.S.
Organic Laboratory Manager

for D.H.N.
Darrell H. Nelson, B.S.
Laboratory Director

KAD/DHN:kdm

ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996

LAB No: SP 605182-4

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Inorganic Analysis

Sample Site: MW1 Quarterly Sampling Area 317
Description: MW1/H/31
Sampled by : Abdun-Nur/Bricker
Type of Sample: Monitoring Well

Sampled : June 26, 1996
Received : June 26, 1996
Completed : July 5, 1996
QA/QC ID# : 60518204-

Analytical Results

CONSTITUENT	METHOD	UNITS	DLR	RESULTS
Chloride	4110B	mg/L	10♦	150
Sulfate	4110B	mg/L	1	13

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR.
ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.
Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Yee Ren, M.S.
Environmental Chemist

Darrell H. Nelson, B.S.
Laboratory Director

YR/DHN:kdm

ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996

LAB No: SP 605182-5

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Organic Analysis
Matrix: Monitoring Well

Project/Site: MW1 Quarterly Sampling Area 317
Sample Description: MW1/0/31
Sampled by : Abdun-Nur/Bricker
Container : VOA
Preservatives:

Sampled : June 26, 1996
Received : June 26, 1996
Extracted : N/A
Analyzed : July 2, 1996
QA/QC ID# : SP 96070201H A

EPA METHOD 624

CONSTITUENT	SAMPLE DLR ug/L	SAMPLE RESULTS ug/L	LAB DLR ug/L	BLANK RESULTS ug/L
Trichloroethylene	0.5	ND	0.5	ND

SURROGATES	SAMPLE AR	SAMPLE % REC.	LAB BLANK AR	LAB BLANK % REC.
1,2-Dichloroethane-d4	40-140	94	40-140	94
Toluene-d8	64-139	97	64-139	95
BFB	50-149	87	50-149	86

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)
ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR. AR = Acceptable Range
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

If you have any questions, please call.

FGL ENVIRONMENTAL

Kelly A. Dunnahoo, B.S.
Organic Laboratory Manager

for D.H.N.
Darrell H. Nelson, B.S.
Laboratory Director

KAD/DHN:kdm

FGL ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996 LAB No: SP 605182-6

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Inorganic Analysis

Sample Site: MW1 Quarterly Sampling Area 317
Description: MW1/R/31
Sampled by : Abdun-Nur/Bricker
Type of Sample: Monitoring Well

Sampled : June 26, 1996
Received : June 26, 1996
Completed : July 3, 1996
QA/QC ID# : 60518206-

Analytical Results

CONSTITUENT	METHOD	UNITS	DLR	RESULTS	MCL
Iron	200.7	ug/L	50	ND	300
Manganese	200.8	ug/L	0.5	2.1	50
Sodium	200.7	mg/L	1	53	

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR.
ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.
Preservatives: (1) Cool 4°C (2) HNO_3 pH < 2 Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Yee Ren, M.S.
Environmental Chemist

Darrell H. Nelson, B.S.
Laboratory Director

YR/DHN:kdm

July 18, 1996

INORGANIC Quality Assurance Report for sample: 605182

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

Constituent	BATCH ID	Method	Units	BLANK QA/QC DLR	Result	NOTE	CALIBRATION QA/QC Type	Conc.	% REC	AR	NOTE	METHOD QA/QC Type	Conc.	% REC	% REC	AR	% DIF	MAV	NOTE
Iron	1A 0B	200.7	ug/L	50	ND		CCV	10000	101	90-110		MS	500	88.0	89.9	75-125	1.9	20.0	
Manganese	7E 2A	200.8	ug/L	0.50	ND		CCV	250	108	90-110		MS	83.3	93.6	92.6	75-125	1.1	20.0	
Sodium	1A 0B	200.7	mg/L	1.0	ND		CCV	10.0	99.5	90-110		MS	20.0	109	114	75-125	1.2	20.0	
Chloride	9A 2B	4110B	mg/L	1.0	ND		CCV	20.0	91.9	90-110		MS	200	95.8	91.0	85-111	1.4	4.1	
Conductivity	5A 0A	2510B	umhos/c2	1.0	ND		CCV	1410	96.8	75-125		Dup	2160	N/A	N/A	N/A	0.0	1.3	
pH	0A 0A	4500-H B	units		N/A		CCV	8.00	99.6	90-110		Dup	10.1	N/A	N/A	N/A	0.0	1.4	
Sulfate	9A 2B	4110B	mg/L	1.0	ND		CCV	20.0	99.4	90-110		MS	200	98.2	97.5	80-120	0.2	20.0	

FGL ID = 19960626 ND => Not Detected at ar above DLR. DLR => Detection Limit for Reporting purposes. N/A => Not Applicable NOTE => See note indicated below.

FGL ENVIRONMENTAL, INC.

[signature] for K.W.

Kurt Wilkinson, B.S., QA Director

YR/DHN:kdm

ENVIRONMENTAL

Analytical Chemists

July 18, 1996

ORGANIC Quality Assurance Report for sample: 605182

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

Constituent	BATCH ID	EPA Method	Units	CALIBRATION QA/QC Type	Conc.	% REC	AR	NOTE	METHOD QA/QC Type	Conc.	% REC	% REC	AR	% DIF	MAV	NOTE
1,2-Dichloroethane-d4	OH10A	624	ug/L	LCS	10.0	93.7	40-140		BS	10.0	93.4	94.7	40-140	1.4	30.0	
Toluene-d8	OH10A	624	ug/L	LCS	10.0	96.3	64-139		BS	10.0	95.3	95.2	64-139	0.1	30.0	
BFB	OH10A	624	ug/L	LCS	10.0	90.6	50-149		BS	10.0	87.0	85.9	50-149	1.3	30.0	
Trichloroethylene	OH10A	624	ug/L	LCS	10.0	86.2	37-151		BS	10.0	93.4	96.8	37-151	3.5	23.0	
TOC	OA 2A	415.1	mg/L	LCS	50.0	98.0	75-125		MS	50.0	112	106	75-125	5.5	20.0	
TOX	OA 2A	TOX	ug/L	CCV	10.0	100	74-116		MS	100	123	3150	75-125	185	20.0	105

FGL ID = 19960702 N/A => Not Applicable NOTE => See note indicated below.

Notes:
105 Lab error determined to be the cause. The problem was identified and does not affect the samples. Batch qualified by LCS, and/or CCV.

FGL ENVIRONMENTAL, INC.

KAD/DHN:kdm

Kurt Wilkinson, B.S., QA Director

Corporate Offices & Laboratory
P.O. Box 272 / 853 Corporation Street
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Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: (209) 942-0181

Field Office
Visalia, California
TEL: (209) 734-9473
Mobile: (209) 737-2399

FGL ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996

LAB No: SP 605183-1

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Inorganic Analysis

Sample Site: MW3 Quarterly Sampling Area 317
Description: MW3/A/31
Sampled by : Abdun-Nur/Bricker
Type of Sample: Monitoring Well

Sampled : June 26, 1996
Received : June 26, 1996
Completed : July 1, 1996
QA/QC ID# : 60518301-

Analytical Results

CONSTITUENT	METHOD	UNITS	DLR	RESULTS
Conductivity	2510B	umhos/cm2	1	600
pH	4500-H B	units	---	7.9

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR.
ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.
Preservatives: (1) Cool 4°C (2) H_2SO_4 pH < 2 Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Yee Ren, M.S.
Environmental Chemist

Darrell H. Nelson, B.S.
Laboratory Director

YR/DHN:kdm

ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996

LAB No: SP 605183-2

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Organic Analysis
Matrix: Monitoring Well

Project/Site: MW3 Quarterly Sampling Area 317
Sample Description: MW3/B/31
Sampled by : Abdun-Nur/Bricker
Container : Amber Glass TFE-Cap
Preservatives: H_2SO_4 pH < 2

Sampled : June 26, 1996
Received : June 26, 1996
Extracted : N/A
Analyzed : July 2, 1996
QA/QC ID# : SP 96070200A A

TOTAL ORGANIC CARBON

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOC	415.1	mg/L	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)
mg/L = Milligrams Per Liter (ppm) ND = Not Detected at or above the DLR.
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

See attached for Quality Assurance report. If you have any questions, please call.

FGL ENVIRONMENTAL

Kelly A. Dunnahoo, B.S.
Organic Laboratory Manager

for D.H.N.
Darrell H. Nelson, B.S.
Laboratory Director

KAD/DHN:kdm

FGL ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996

LAB No: SP 605183-3

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Organic Analysis
Matrix: Monitoring Well

Project/Site: MW3 Quarterly Sampling Area 317
Sample Description: MW3/C/31
Sampled by : Abdun-Nur/Bricker
Container : Amber Glass TFE-Cap
Preservatives: H2SO4 pH < 2

Sampled : June 26, 1996
Received : June 26, 1996
Extracted : N/A
Analyzed : July 2, 1996
QA/QC ID# : SP 96070200A A

TOTAL ORGANIC HALOGENS

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOX	9020	ug/L	5	ND	5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)
ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

See attached for Quality Assurance report. If you have any questions, please call.

FGL ENVIRONMENTAL

Kelly A. Dunnahoo, B.S.
Organic Laboratory Manager

for D.H.N.
Darrell H. Nelson, B.S.
Laboratory Director

KAD/DHN:kdm

ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996

LAB No: SP 605183-4

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Inorganic Analysis

Sample Site: MW3 Quarterly Sampling Area 317
Description: MW3/H/31
Sampled by : Abdun-Nur/Bricker
Type of Sample: Monitoring Well

Sampled : June 26, 1996
Received : June 26, 1996
Completed : June 26, 1996
QA/QC ID# : 60518304-

Analytical Results

CONSTITUENT	METHOD	UNITS	DLR	RESULTS
Chloride	4110B	mg/L	1	31
Sulfate	4110B	mg/L	1	78

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR.
ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.
Preservatives: (1) Cool 4°C (2) H2SO4 pH < 2 Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Yee Ren, M.S.
Environmental Chemist

Darrell H. Nelson, B.S.
Laboratory Director

YR/DHN:kdm

FGL ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996

LAB No: SP 605183-5

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Organic Analysis
Matrix: Monitoring Well

Project/Site: MW3 Quarterly Sampling Area 317
Sample Description: MW3/O/31
Sampled by : Abdun-Nur/Bricker
Container : VOA
Preservatives:

Sampled : June 26, 1996
Received : June 26, 1996
Extracted : N/A
Analyzed : July 2, 1996
QA/QC ID# : SP 96070201H A

EPA METHOD 624

CONSTITUENT	SAMPLE DLR ug/L	SAMPLE RESULTS ug/L	LAB DLR ug/L	BLANK RESULTS ug/L
Trichloroethylene	0.5	ND	0.5	ND

SURROGATES	SAMPLE AR	SAMPLE % REC.	LAB BLANK AR	LAB BLANK % REC.
1,2-Dichloroethane-d4	40-140	96	40-140	94
Toluene-d8	64-139	98	64-139	95
BFB	50-149	88	50-149	86

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)
ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR. AR = Acceptable Range
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

See attached for Quality Assurance report. If you have any questions, please call.

FGL ENVIRONMENTAL

Kelly A. Dunnahoo, B.S.
Organic Laboratory Manager

for D.H.N.

Darrell H. Nelson, B.S.
Laboratory Director

KAD/DHN:kdm

ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996

LAB No: SP 605183-6

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Inorganic Analysis

Sample Site: MW3 Quarterly Sampling Area 317
Description: MW3/R/31
Sampled by : Abdun-Nur/Bricker
Type of Sample: Monitoring Well

Sampled : June 26, 1996
Received : June 26, 1996
Completed : July 3, 1996
QA/QC ID# : 60518306-

Analytical Results

CONSTITUENT	METHOD	UNITS	DLR	RESULTS	MCL
Iron	200.7	ug/L	50	ND	300
Manganese	200.8	ug/L	0.5	3.3	50
Sodium	200.7	mg/L	1	61	

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR.
ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.
Preservatives: (1) Cool 4°C (2) HNO_3 pH < 2 Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Yee Ren, M.S.
Environmental Chemist

Darrell H. Nelson, B.S.
Laboratory Director

YR/DHN:kdm

FGL ENVIRONMENTAL

Analytical Chemists

July 18, 1996 INORGANIC Quality Assurance Report for sample: 605183

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

Constituent	BATCH ID	Method	Units	BLANK QA/QC DLR	Result	NOTE	CALIBRATION QA/QC Type	Conc.	% REC	AR	NOTE	METHOD QA/QC Type	Conc.	% REC	% REC	AR	% DIF	MAV	NOTE
Iron	1A 0B	200.7	ug/L	50	ND		CCV	10000	101	90-110		MS	500	88.0	89.9	75-125	1.9	20.0	
Manganese	7E 2A	200.8	ug/L	0.50	ND		CCV	250	108	90-110		MS	83.3	93.6	92.6	75-125	1.1	20.0	
Sodium	1A 0B	200.7	mg/L	1.0	ND		CCV	10.0	99.5	90-110		MS	20.0	109	114	75-125	1.2	20.0	
Chloride	0A 2A1	4110B	mg/L	1.0	ND		CCV	20.0	90.7	90-110		MS	200	128	125	86-106	2.4	4.2	410
Conductivity	5A 0A	2510B	umhos/c2	1.0	ND		CCV	1410	96.8	75-125		Dup	2160	N/A	N/A	N/A	0.0	1.3	
pH	0A 0A	4500-H B	units		N/A		CCV	8.00	99.6	90-110		Dup	10.1	N/A	N/A	N/A	0.0	1.4	
Sulfate	0A 2A1	4110B	mg/L	1.0	ND		CCV	20.0	99.2	90-110		MS	200	475	472	80-120	0.5	20.0	410

FGL ID = 19960626 ND => Not Detected at ar above DLR. DLR => Detection Limit for Reporting purposes. N/A => Not Applicable NOTE => See note indicated below.

Notes:
410 Matrix Spike (MS) not within Acceptance Range (AR) and/or Relative Percent Difference (RPD) not within Maximum Allowable Value (MAV). Batch qualified based on the LCS, CCV, or ICV recovery.

FGL ENVIRONMENTAL, INC.

Rdf for K.W.

Kurt Wilkinson, B.S., QA Director

YR/DHN:kdm

FGL ENVIRONMENTAL

Analytical Chemists

July 18, 1996

ORGANIC Quality Assurance Report for sample: 605183

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

Constituent	BATCH ID	EPA Method	Units	CALIBRATION QA/QC Type	Conc.	% REC	AR	NOTE	METHOD QA/QC Type	Conc.	% REC	% REC	AR	% DIF	MAV	NOTE
1,2-Dichloroethane-d4	OH10A	624	ug/L	LCS	10.0	93.7	40-140		BS	10.0	93.4	94.7	40-140	1.4	30.0	
Toluene-d8	OH10A	624	ug/L	LCS	10.0	96.3	64-139		BS	10.0	95.3	95.2	64-139	0.1	30.0	
BFB	OH10A	624	ug/L	LCS	10.0	90.6	50-149		BS	10.0	87.0	85.9	50-149	1.3	30.0	
Trichloroethylene	OH10A	624	ug/L	LCS	10.0	86.2	37-151		BS	10.0	93.4	96.8	37-151	3.5	23.0	
TOC	OA 2A	415.1	mg/L	LCS	50.0	98.0	75-125		MS	50.0	112	106	75-125	5.5	20.0	
TOX	OA 2A	TOX	ug/L	CCV	10.0	100	74-116		MS	100	123	3150	75-125	185	20.0	105

FGL ID = 19960702   N/A => Not Applicable   NOTE => See note indicated below.

Notes:
105 Lab error determined to be the cause. The problem was identified and does not affect the samples.
Batch qualified by LCS, and/or CCV.

FGL ENVIRONMENTAL, INC.

Kurt Wilkinson, B.S., QA Director

KAD/DHN:kdm

ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996

LAB No: SP 605184-1

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Inorganic Analysis

Sample Site: MW5 Quarterly Sampling Area 317
Description: MW5/A/31
Sampled by : Abdun-Nur/Bricker
Type of Sample: Monitoring Well

Sampled : June 26, 1996
Received : June 26, 1996
Completed : July 1, 1996
QA/QC ID# : 60518401-

Analytical Results

CONSTITUENT	METHOD	UNITS	DLR	RESULTS
Conductivity	2510B	umhos/cm2	1	520
pH	4500-H B	units	---	7.7

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR.
ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.
Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Yee Ren, M.S.
Environmental Chemist

Darrell H. Nelson, B.S.
Laboratory Director

YR/DHN:kdm

ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996

LAB No: SP 605184-2

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Organic Analysis
Matrix: Monitoring Well

Project/Site: MW5 Quarterly Sampling Area 317
Sample Description: MW5/B/31
Sampled by : Abdun-Nur/Bricker
Container : Amber Glass TFE-Cap
Preservatives: H2SO4 pH < 2

Sampled : June 26, 1996
Received : June 26, 1996
Extracted : N/A
Analyzed : July 2, 1996
QA/QC ID# : SP 96070200A A

TOTAL ORGANIC CARBON

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOC	415.1	mg/L	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)
mg/L = Milligrams Per Liter (ppm) ND = Not Detected at or above the DLR.
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

See attached for Quality Assurance report. If you have any questions, please call.

FGL ENVIRONMENTAL

Kelly A. Dunnahoo, B.S.
Organic Laboratory Manager

for D.H.N.
Darrell H. Nelson, B.S.
Laboratory Director

KAD/DHN:kdm

ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996

LAB No: SP 605184-3

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Organic Analysis
Matrix: Monitoring Well

Project/Site: MW5 Quarterly Sampling Area 317
Sample Description: MW5/C/31
Sampled by : Abdun-Nur/Bricker
Container : Amber Glass TFE-Cap
Preservatives: H2SO4 pH < 2

Sampled : June 26, 1996
Received : June 26, 1996
Extracted : N/A
Analyzed : July 2, 1996
QA/QC ID# : SP 96070200A A

TOTAL ORGANIC HALOGENS

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOX	9020	ug/L	5	ND	5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)
ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

See attached for Quality Assurance report. If you have any questions, please call.

FGL ENVIRONMENTAL

Kelly A. Dunnahoo, B.S.
Organic Laboratory Manager

[signature] for D.H.N.
Darrell H. Nelson, B.S.
Laboratory Director

KAD/DHN:kdm

ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996

LAB No: SP 605184-4

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Inorganic Analysis

Sample Site: MW5 Quarterly Sampling Area 317
Description: MW5/H/31
Sampled by : Abdun-Nur/Bricker
Type of Sample: Monitoring Well

Sampled : June 26, 1996
Received : June 26, 1996
Completed : June 26, 1996
QA/QC ID# : 60518404-

Analytical Results

CONSTITUENT	METHOD	UNITS	DLR	RESULTS
Chloride	4110B	mg/L	1	50
Sulfate	4110B	mg/L	1	34

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR.
ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.
Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Yee Ren, M.S.
Environmental Chemist

Darrell H. Nelson, B.S.
Laboratory Director

YR/DHN:kdm

FGL ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996

LAB No: SP 605184-5

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Organic Analysis
Matrix: Monitoring Well

Project/Site: MW5 Quarterly Sampling Area 317
Sample Description: MW5/0/31
Sampled by : Abdun-Nur/Bricker
Container : VOA
Preservatives:

Sampled : June 26, 1996
Received : June 26, 1996
Extracted : N/A
Analyzed : July 2, 1996
QA/QC ID# : SP 96070201H A

EPA METHOD 624

CONSTITUENT	SAMPLE DLR ug/L	SAMPLE RESULTS ug/L	LAB DLR ug/L	BLANK RESULTS ug/L
Trichloroethylene	0.5	ND	0.5	ND

SURROGATES	SAMPLE AR	SAMPLE % REC.	LAB BLANK AR	LAB BLANK % REC.
1,2-Dichloroethane-d4	40-140	99	40-140	94
Toluene-d8	64-139	97	64-139	95
BFB	50-149	89	50-149	86

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)
ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR. AR = Acceptable Range
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

See attached for Quality Assurance report. If you have any questions, please call.

FGL ENVIRONMENTAL

Kelly A. Dunnahoo, B.S.
Organic Laboratory Manager

for D.H.N.
Darrell H. Nelson, B.S.
Laboratory Director

KAD/DHN:kdm

ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996 LAB No: SP 605184-6

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Inorganic Analysis

Sample Site: MW5 Quarterly Sampling Area 317
Description: MW5/R/31
Sampled by : Abdun-Nur/Bricker
Type of Sample: Monitoring Well

Sampled : June 26, 1996
Received : June 26, 1996
Completed : July 3, 1996
QA/QC ID# : 60518406-

Analytical Results

CONSTITUENT	METHOD	UNITS	DLR	RESULTS	MCL
Iron	200.7	ug/L	50	ND	300
Manganese	200.8	ug/L	0.5	1.5	50
Sodium	200.7	mg/L	1	55	

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR.
ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.
Preservatives: (1) Cool 4°C (2) HNO3 pH < 2 Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Yee Ren, M.S.
Environmental Chemist

Darrell H. Nelson, B.S.
Laboratory Director

YR/DHN:kdm

FGL ENVIRONMENTAL

Analytical Chemists

July 18, 1996 INORGANIC Quality Assurance Report for sample: 605184

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

Constituent	BATCH ID	Method	Units	BLANK QA/QC DLR	Result	NOTE	CALIBRATION QA/QC Type	Conc.	% REC	AR	NOTE	METHOD QA/QC Type	Conc.	% REC	% REC	AR	% DIF	MAV	NOTE
Iron	1A 0B	200.7	ug/L	50	ND		CCV	10000	101	90-110		MS	500	88.0	89.9	75-125	1.9	20.0	
Manganese	7E 2A	200.8	ug/L	0.50	ND		CCV	250	108	90-110		MS	83.3	93.6	92.6	75-125	1.1	20.0	
Sodium	1A 0B	200.7	mg/L	1.0	ND		CCV	10.0	99.5	90-110		MS	20.0	109	114	75-125	1.2	20.0	
Chloride	0A 2A1	4110B	mg/L	1.0	ND		CCV	20.0	90.7	90-110		MS	200	128	125	86-106	2.4	4.2	410
Conductivity	5A 0A	2510B	umhos/c2	1.0	ND		CCV	1410	96.8	75-125		Dup	2160	N/A	N/A	N/A	0.0	1.3	
pH	0A 0A	4500-H B	units		N/A		CCV	8.00	99.6	90-110		Dup	10.1	N/A	N/A	N/A	0.0	1.4	
Sulfate	0A 2A1	4110B	mg/L	1.0	ND		CCV	20.0	99.2	90-110		MS	200	475	472	80-120	0.5	20.0	410

FGL ID = 19960626 ND => Not Detected at or above DLR. DLR => Detection Limit for Reporting purposes. N/A => Not Applicable NOTE => See note indicated below.

Notes:
410 Matrix Spike (MS) not within Acceptance Range (AR) and/or Relative Percent Difference (RPD) not within Maximum Allowable Value (MAV). Batch qualified based on the LCS, CCV, or ICV recovery.

FGL ENVIRONMENTAL, INC.

YR/DHN:kdm

for K.W.
Kurt Wilkinson, B.S., QA Director

FGL ENVIRONMENTAL

Analytical Chemists

July 18, 1996

ORGANIC Quality Assurance Report for sample: 605184

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

Constituent	BATCH ID	EPA Method	Units	CALIBRATION QA/QC Type	Conc.	% REC	AR	NOTE	METHOD QA/QC Type	Conc.	% REC	% REC	AR	% DIF	MAV	NOTE
1,2-Dichloroethane-d4	OH10A	624	ug/L	LCS	10.0	93.7	40-140		BS	10.0	93.4	94.7	40-140	1.4	30.0	
Toluene-d8	OH10A	624	ug/L	LCS	10.0	96.3	64-139		BS	10.0	95.3	95.2	64-139	0.1	30.0	
BFB	OH10A	624	ug/L	LCS	10.0	90.6	50-149		BS	10.0	87.0	85.9	50-149	1.3	30.0	
Trichloroethylene	OH10A	624	ug/L	LCS	10.0	86.2	37-151		BS	10.0	93.4	96.8	37-151	3.5	23.0	
TOC	OA 2A	415.1	mg/L	LCS	50.0	98.0	75-125		MS	50.0	112	106	75-125	5.5	20.0	
TOX	OA 2A	TOX	ug/L	CCV	10.0	100	74-116		MS	100	123	3150	75-125	185	20.0	105

FGL ID = 19960702 N/A => Not Applicable NOTE => See note indicated below.

Notes:
105 Lab error determined to be the cause. The problem was identified and does not affect the samples. Batch qualified by LCS, and/or CCV.

FGL ENVIRONMENTAL, INC.

Kurt Wilkinson, B.S., QA Director

KAD/DHN:kdm

ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996

LAB No: SP 605185-1

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Inorganic Analysis

Sample Site: MW6 Quarterly Sampling Area 317
Description: MW6/A/31
Sampled by : Abdun-Nur/Bricker
Type of Sample: Monitoring Well

Sampled : June 26, 1996
Received : June 26, 1996
Completed : July 1, 1996
QA/QC ID# : 60518501-

Analytical Results

CONSTITUENT	METHOD	UNITS	DLR	RESULTS
Conductivity	2510B	umhos/cm2	1	570
pH	4500-H B	units	---	7.7

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR.
ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.
Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Yee Ren, M.S.
Environmental Chemist

Darrell H. Nelson, B.S.
Laboratory Director

YR/DHN:kdm

ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996

LAB No: SP 605185-2

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Organic Analysis
Matrix: Monitoring Well

Project/Site: MW6 Quarterly Sampling Area 317
Sample Description: MW6/B/31
Sampled by : Abdun-Nur/Bricker
Container : Amber Glass TFE-Cap
Preservatives: H2SO4 pH < 2

Sampled : June 26, 1996
Received : June 26, 1996
Extracted : N/A
Analyzed : July 2, 1996
QA/QC ID# : SP 96070200A A

TOTAL ORGANIC CARBON

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOC	415.1	mg/L	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)
mg/L = Milligrams Per Liter (ppm) ND = Not Detected at or above the DLR.
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

See attached for Quality Assurance report. If you have any questions, please call.

FGL ENVIRONMENTAL

Kelly A. Dunnahoo, B.S.
Organic Laboratory Manager

for D.H.N.
Darrell H. Nelson, B.S.
Laboratory Director

KAD/DHN:kdm

Corporate Offices & Laboratory
PO Box 272 / 853 Corporation Street
Santa Paula, CA 93061-0272

Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215

Field Office
Visalia, CA
TEL: 209/734-9473

FGL ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996

LAB No: SP 605185-3

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Organic Analysis
Matrix: Monitoring Well

Project/Site: MW6 Quarterly Sampling Area 317
Sample Description: MW6/C/31
Sampled by : Abdun-Nur/Bricker
Container : Amber Glass TFE-Cap
Preservatives: H2SO4 pH < 2

Sampled : June 26, 1996
Received : June 26, 1996
Extracted : N/A
Analyzed : July 2, 1996
QA/QC ID# : SP 96070200A A

TOTAL ORGANIC HALOGENS

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOX	9020	ug/L	5	ND	5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)
ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

See attached for Quality Assurance report. If you have any questions, please call.

FGL ENVIRONMENTAL

Kelly A. Dunnahoo, B.S.
Organic Laboratory Manager

for D.H.N.
Darrell H. Nelson, B.S.
Laboratory Director

KAD/DHN:kdm

Corporate Offices & Laboratory
PO Box 272 / 853 Corporation Street
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Office & Laboratory
2500 Stagecoach Road
Stockton, CA 95215
TEL: 209/942-0181

Field Office
Visalia, CA
TEL: 209/734-9473
FAX: [illegible]

FGL ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996

LAB No: SP 605185-4

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Inorganic Analysis

Sample Site: MW6 Quarterly Sampling Area 317
Description: MW6/H/31
Sampled by : Abdun-Nur/Bricker
Type of Sample: Monitoring Well

Sampled : June 26, 1996
Received : June 26, 1996
Completed : June 26, 1996
QA/QC ID# : 60518504-

Analytical Results

CONSTITUENT	METHOD	UNITS	DLR	RESULTS
Chloride	4110B	mg/L	1	70
Sulfate	4110B	mg/L	1	34

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR.
ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.
Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Yee Ren, M.S.
Environmental Chemist

Darrell H. Nelson, B.S.
Laboratory Director

YR/DHN:kdm

ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996

LAB No: SP 605185-5

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Organic Analysis
Matrix: Monitoring Well

Project/Site: MW6 Quarterly Sampling Area 317
Sample Description: MW6/0/31
Sampled by : Abdun-Nur/Bricker
Container : VOA
Preservatives:

Sampled : June 26, 1996
Received : June 26, 1996
Extracted : N/A
Analyzed : July 2, 1996
QA/QC ID# : SP 96070201H A

EPA METHOD 624

CONSTITUENT	SAMPLE DLR ug/L	SAMPLE RESULTS ug/L	LAB DLR ug/L	BLANK RESULTS ug/L
Trichloroethylene	0.5	ND	0.5	ND

SURROGATES	SAMPLE AR	SAMPLE % REC.	LAB BLANK AR	LAB BLANK % REC.
1,2-Dichloroethane-d4	40-140	95	40-140	94
Toluene-d8	64-139	97	64-139	95
BFB	50-149	88	50-149	86

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)
ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR. AR = Acceptable Range
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

See attached for Quality Assurance report. If you have any questions, please call.

FGL ENVIRONMENTAL

Kelly A. Dunnahoo, B.S.
Organic Laboratory Manager

for D.H.N.
Darrell H. Nelson, B.S.
Laboratory Director

KAD/DHN:kdm

ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 18, 1996

LAB No: SP 605185-6

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Inorganic Analysis

Sample Site: MW6 Quarterly Sampling Area 317
Description: MW6/R/31
Sampled by : Abdun-Nur/Bricker
Type of Sample: Monitoring Well

Sampled : June 26, 1996
Received : June 26, 1996
Completed : July 3, 1996
QA/QC ID# : 60518506-

Analytical Results

CONSTITUENT	METHOD	UNITS	DLR	RESULTS	MCL
Iron	200.7	ug/L	50	ND	300
Manganese	200.8	ug/L	0.5	1.3	50
Sodium	200.7	mg/L	1	56	

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR.
ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.
Preservatives: (1) Cool 4°C (2) HNO_3 pH < 2 Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Yee Ren, M.S.
Environmental Chemist

Darrell H. Nelson, B.S.
Laboratory Director

YR/DHN:kdm

FGL ENVIRONMENTAL

Analytical Chemists

July 18, 1996

INORGANIC Quality Assurance Report for sample: 605185

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

Constituent	BATCH ID	Method	Units	BLANK QA/QC DLR	Result	NOTE	CALIBRATION QA/QC Type	Conc.	% REC	AR	NOTE	METHOD QA/QC Type	Conc.	% REC	% REC	AR	% DIF	MAV	NOTE
Iron	1A 0B	200.7	ug/L	50	ND		CCV	10000	101	90-110		MS	500	88.0	89.9	75-125	1.9	20.0	
Manganese	7E 2A	200.8	ug/L	0.50	ND		CCV	250	108	90-110		MS	83.3	93.6	92.6	75-125	1.1	20.0	
Sodium	1A 0B	200.7	mg/L	1.0	ND		CCV	10.0	99.5	90-110		MS	20.0	109	114	75-125	1.2	20.0	
Chloride	0A 2A1	4110B	mg/L	1.0	ND		CCV	20.0	90.7	90-110		MS	200	128	125	86-106	2.4	4.2	410
Conductivity	5A 0A	2510B	umhos/c2	1.0	ND		CCV	1410	96.8	75-125		Dup	2160	N/A	N/A	N/A	0.0	1.3	
pH	0A 0A	4500-H B	units		N/A		CCV	8.00	99.6	90-110		Dup	10.1	N/A	N/A	N/A	0.0	1.4	
Sulfate	0A 2A1	4110B	mg/L	1.0	ND		CCV	20.0	99.2	90-110		MS	200	475	472	80-120	0.5	20.0	410

FGL ID = 19960626 ND => Not Detected at ar above DLR. DLR => Detection Limit for Reporting purposes. N/A => Not Applicable NOTE => See note indicated below.

Notes:
410 Matrix Spike (MS) not within Acceptance Range (AR) and/or Relative Percent Difference (RPD) not within Maximum Allowable Value (MAV). Batch qualified based on the LCS, CCV, or ICV recovery.

FGL ENVIRONMENTAL, INC.

[signature] for K.W.

Kurt Wilkinson, B.S., QA Director

YR/DHN:kdm

FGL ENVIRONMENTAL

Analytical Chemists

July 18, 1996 ORGANIC Quality Assurance Report for sample: 605185

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

Constituent	BATCH ID	EPA Method	Units	CALIBRATION QA/QC Type	Conc.	% REC	AR	NOTE	METHOD QA/QC Type	Conc.	% REC	% REC	AR	% DIF	MAV	NOTE
1,2-Dichloroethane-d4	OH10A	624	ug/L	LCS	10.0	93.7	40-140		BS	10.0	93.4	94.7	40-140	1.4	30.0	
Toluene-d8	OH10A	624	ug/L	LCS	10.0	96.3	64-139		BS	10.0	95.3	95.2	64-139	0.1	30.0	
BFB	OH10A	624	ug/L	LCS	10.0	90.6	50-149		BS	10.0	87.0	85.9	50-149	1.3	30.0	
Trichloroethylene	OH10A	624	ug/L	LCS	10.0	86.2	37-151		BS	10.0	93.4	96.8	37-151	3.5	23.0	
TOC	OA 2A	415.1	mg/L	LCS	50.0	98.0	75-125		MS	50.0	112	106	75-125	5.5	20.0	
TOX	OA 2A	TOX	ug/L	CCV	10.0	100	74-116		MS	100	123	3150	75-125	185	20.0	105

FGL ID = 19960702 N/A => Not Applicable NOTE => See note indicated below.

Notes:
105 Lab error determined to be the cause. The problem was identified and does not affect the samples. Batch qualified by LCS, and/or CCV.

FGL ENVIRONMENTAL, INC.

~~Kurt~~ Wilkinson, B.S., QA Director

KAD/DHN:kdm

FGL ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 15, 1996

LAB No: SP 605256-1

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Inorganic Analysis

Sample Site: MW10 Quarterly Sampling Area 317
Description: MW10/A/31
Sampled by : Abdun-Nur/Bricker
Type of Sample: Monitoring Well

Sampled : June 27, 1996
Received : June 28, 1996
Completed : July 2, 1996
QA/QC ID# : 60525601-

Analytical Results

CONSTITUENT	METHOD	UNITS	DLR	RESULTS
Conductivity	2510B	umhos/cm2	1	600
pH	4500-H B	units	---	7.7

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR.
ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.
Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Yee Ren, M.S.
Environmental Chemist

Darrell H. Nelson, B.S.
Laboratory Director

YR/DHN:kdm

ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 15, 1996

LAB No: SP 605256-2

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Organic Analysis
Matrix: Monitoring Well

Project/Site: MW10 Quarterly Sampling Area 317
Sample Description: MW10/B/31
Sampled by : Abdun-Nur/Bricker
Container : Amber Glass TFE-Cap
Preservatives: H_2SO_4 pH < 2

Sampled : June 27, 1996
Received : June 28, 1996
Extracted : N/A
Analyzed : July 2, 1996
QA/QC ID# : SP 96070200A A

TOTAL ORGANIC CARBON

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOC	415.1	mg/L	0.5	ND	0.5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)
mg/L = Milligrams Per Liter (ppm) ND = Not Detected at or above the DLR.
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

See attached for Quality Assurance report. If you have any questions, please call.

FGL ENVIRONMENTAL

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FGL ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 15, 1996

LAB No: SP 605256-3

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Organic Analysis
Matrix: Monitoring Well

Project/Site: MW10 Quarterly Sampling Area 317
Sample Description: MW10/C/31
Sampled by : Abdun-Nur/Bricker
Container : Amber Glass TFE-Cap
Preservatives: H_2SO_4 pH < 2

Sampled : June 27, 1996
Received : June 28, 1996
Extracted : N/A
Analyzed : July 2, 1996
QA/QC ID# : SP 96070200A A

TOTAL ORGANIC HALOGENS

CONSTITUENT	EPA METHOD	UNITS	SAMPLE DLR	SAMPLE RESULTS	LAB DLR	BLANK RESULTS
TOX	9020	ug/L	5	ND	5	ND

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)
ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR.
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

See attached for Quality Assurance report. If you have any questions, please call.

FGL ENVIRONMENTAL

Kelly A. Dunnahoo, B.S.
Organic Laboratory Manager

Darrell H. Nelson, B.S.
Laboratory Director

KAD/DHN:kdm

FGL ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 15, 1996

LAB No: SP 605256-4

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Inorganic Analysis

Sample Site: MW10 Quarterly Sampling Area 317
Description: MW10/H/31
Sampled by : Abdun-Nur/Bricker
Type of Sample: Monitoring Well

Sampled : June 27, 1996
Received : June 28, 1996
Completed : June 28, 1996
QA/QC ID# : 60525604-

Analytical Results

CONSTITUENT	METHOD	UNITS	DLR	RESULTS
Chloride	4110B	mg/L	1	70
Sulfate	4110B	mg/L	1	43

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR.
ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.
Preservatives: (1) Cool 4°C Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Yee Ren, M.S.
Environmental Chemist

Darrell H. Nelson, B.S.
Laboratory Director

YR/DHN:kdm

FGL ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 16, 1996 LAB No: SP 605256-5

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Organic Analysis
Matrix: Monitoring Well

Project/Site: MW10 Quarterly Sampling Area 317
Sample Description: MW10/0/31
Sampled by : Abdun-Nur/Bricker
Container : VOA
Preservatives:

Sampled : June 27, 1996
Received : June 28, 1996
Extracted : N/A
Analyzed : July 2, 1996
QA/QC ID# : SP 96070201H A

EPA METHOD 624

CONSTITUENT	SAMPLE DLR ug/L	SAMPLE RESULTS ug/L	LAB DLR ug/L	BLANK RESULTS ug/L
Trichloroethylene	0.5	ND	0.5	ND

SURROGATES	SAMPLE AR	SAMPLE % REC.	LAB BLANK AR	LAB BLANK % REC.
1,2-Dichloroethane-d4	40-140	95	40-140	94
Toluene-d8	64-139	95	64-139	95
BFB	50-149	89	50-149	86

DLR = Detection Limit for Reporting Purposes. MCL = Maximum Contaminant Level (--- indicates none determined.)
ug/L = Micrograms Per Liter (ppb) ND = Not Detected at or above the DLR. AR = Acceptable Range
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.

If you have any questions, please call.

FGL ENVIRONMENTAL

Kelly A. Dunnahoo, B.S.
Organic Laboratory Manager

Darrell H. Nelson, B.S.
Laboratory Director

KAD/DHN:kdm

ENVIRONMENTAL

ANALYTICAL CHEMISTS

July 15, 1996

LAB No: SP 605256-6

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

RE: Inorganic Analysis

Sample Site: MW10 Quarterly Sampling Area 317
Description: MW10/R/31
Sampled by : Abdun-Nur/Bricker
Type of Sample: Monitoring Well

Sampled : June 27, 1996
Received : June 28, 1996
Completed : July 12, 1996
QA/QC ID# : 60525606-

Analytical Results

CONSTITUENT	METHOD	UNITS	DLR	RESULTS	MCL
Iron	200.7	ug/L	50	ND	300
Manganese	200.8	ug/L	0.5	1.8	50
Sodium	200.7	mg/L	1	80	

DLR = Detection Limit for Reporting Purposes. ND = Not Detected at or above the DLR.
ug/L = Micrograms Per Liter (ppb) mg/L = Milligrams Per Liter (ppm) mg/kg = Milligrams Per Kilogram
♦ = DLR adjusted because of dilutions, concentrations, or limited sample.
Preservatives: (1) Cool 4°C (2) HNO_3 pH < 2 Containers: (a) Plastic

If you have any questions, please call.

FGL ENVIRONMENTAL

Yee Ren, M.S.
Environmental Chemist

Darrell H. Nelson, B.S.
Laboratory Director

YR/DHN:kdm

FGL ENVIRONMENTAL

Analytical Chemists

July 15, 1996 ORGANIC Quality Assurance Report for sample: 605256

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

Constituent	BATCH ID	EPA Method	Units	CALIBRATION QA/QC Type	Conc.	% REC	AR	NOTE	METHOD QA/QC Type	Conc.	% REC	% REC	AR	% DIF	MAV	NOTE
1,2-Dichloroethane-d4	OH10A	624	ug/L	LCS	10.0	93.7	40-140		BS	10.0	93.4	94.7	40-140	1.4	30.0	
Toluene-d8	OH10A	624	ug/L	LCS	10.0	96.3	64-139		BS	10.0	95.3	95.2	64-139	0.1	30.0	
BFB	OH10A	624	ug/L	LCS	10.0	90.6	50-149		BS	10.0	87.0	85.9	50-149	1.3	30.0	
Trichloroethylene	OH10A	624	ug/L	LCS	10.0	86.2	37-151		BS	10.0	93.4	96.8	37-151	3.5	23.0	
TOC	OA 2A	415.1	mg/L	LCS	50.0	98.0	75-125		MS	50.0	112	106	75-125	5.5	20.0	
TOX	OA 2A	TOX	ug/L	CCV	10.0	100	74-116		MS	100	123	3150	75-125	185	20.0	105

FGL ID = 19960702 N/A => Not Applicable NOTE => See note indicated below.

Notes:
105 Lab error determined to be the cause. The problem was identified and does not affect the samples. Batch qualified by LCS, and/or CCV.

FGL ENVIRONMENTAL, INC.

for Kurt Wilkinson, B.S., QA Director

KAD/DHN:kdm

ENVIRONMENTAL

Analytical Chemists

July 15, 1996

INORGANIC Quality Assurance Report for sample: 605256

Bermite Division of Whittaker
22116 W. Soledad Canyon Road
Saugus , CA 91350

Constituent	BATCH ID	Method	Units	BLANK QA/QC DLR	Result	NOTE	CALIBRATION QA/QC Type	Conc.	% REC	AR	NOTE	METHOD QA/QC Type	Conc.	% REC	% REC	AR	% DIF	MAV	NOTE
Iron	14A 2A	200.7	ug/L	50	ND		CCV	1000	100.0	90-110		MS	500	109	109	75-125	0.7	20.0	
Manganese	11E 0A	200.8	ug/L	0.50	ND		CCV	250	101	90-110		MS	83.3	97.6	90.9	75-125	2.9	20.0	
Sodium	14A 2A	200.7	mg/L	1.0	ND		CCV	1.62	97.6	90-110		MS	20.0	111	59.3	75-125	3.9	20.0	405
Chloride	0A 2C	4110B	mg/L	1.0	ND		CCV	20.0	97.2	90-110		MS	200	68.1	70.4	86-106	3.2	4.2	405
Conductivity	3A 0B	2510B	umhos/c2	1.0	ND		CCV	1410	96.8	75-125		Dup	857	N/A	N/A	N/A	0.6	1.3	
pH	0A 0A	4500-H B	units	N/A			CCV	8.00	102	90-110		Dup	7.57	N/A	N/A	N/A	0.1	1.4	
Sulfate	0A 2C	4110B	mg/L	1.0	ND		CCV	20.0	103	90-110		MS	200	74.0	77.5	80-120	4.5	20.0	405

FGL ID = 19960628   ND => Not Detected at ar above DLR.   DLR => Detection Limit for Reporting purposes.   N/A => Not Applicable   NOTE => See note indicated below.

Notes:
405 Matrix Spike (MS) not within the Acceptance Range (AR) and/or Relative Percent Difference (RPD) not within the Maximum Allowable Value (MAV) because of low concentrations of the spike or sample. Batch qualified based on the LCS, CCV or ICV recovery.

FGL ENVIRONMENTAL, INC.

for K.W.

Kurt Wilkinson, B.S., QA Director

YR/DHN:kdm

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APPENDIX H

STATISTICAL ANALYSES

TABLE H-1

THIRTY-FIRST QUARTER SAMPLING EVENT

Parameter	Units	Tolerance Limit	Well No.		
			MW-5	MW-6	MW-10
Chloride	mg/l	193	50	70	70
pH		7.05/7.98	7.7	7.7	7.7
Specific Conductance	μmhos/cm^2	787	520	570	600
Sulfate	mg/l	104	34	34	43
Iron	μg/l	198	<50	<50	<50
Manganese	μg/l	23.0	1.5	1.3	1.8
Sodium	mg/l	59.9	55	56	80
TCE	μg/l	0.5[a]	<0.5	<0.5	<0.5
TOC	mg/l	3.06	<0.5	<0.5	<0.5
TOX	μg/l	55.0	<5	<5	<5

Note: All tolerance limits are upper limits except pH which has both upper and lower limits.

[a]Tolerance limit set at detection limit.

TABLE H-2

CONCENTRATIONS OF GROUND WATER MONITORING PARAMETERS IN SAMPLES FROM BACKGROUND MONITORING WELL MW-1

Date	Quarter	pH[a]	Conductance[a] (μmhos/cm^2)	TOC[a] (mg/l)	TOX[a] (μg/l)	SO_4^{2-} (mg/l)	Cl^- (mg/l)	Fe (μg/l)	Mn (μg/l)	Na (mg/l)	TCE (μg/l)
10/04/88[b]	1	7.5	598	<3	<100	11					<5
01/25/89	2	7.48	572	2.4[c]	<100	22					
04/17/89	3	7.2		<3	<100	11					
07/27/89	4	7.48	500	2.4[c]	<100	13					
10/31/89	5	7.6	524	<3	<100	10	83				
01/25/90	6	7.4	570	<3	<100	16	85				
04/17/90	7	7.55	504	<4	<20	11	88				
07/17/90	8	8.28	530	<4	<20	10	82				
10/18/90	9	7.4	544	<1	75[c]	23	98				
01/29/91	10	7.5	573	1.4	<5	8	96				
04/23/91	11	7.68	559	1.8	<5	10	100				
07/19/91	12	7.33	575	1.2	<5	11	97				
10/08/91[d]	–	–	–	–	–	–	–				
03/13/92	14	7.5	639	0.4[c]	<5	13	131				
04/21/92	15	7.5	643	<0.5	<5	9	130				
07/29/92	16	7.55	660	<0.5	6.9	11	133				
10/20/92	17	7.5	676	<0.5	<5	10	138				
01/27/93	18	7.68	707	<0.5	<5	6	137				
06/09/93	19	7.5	715	<0.5	<5	9	134	250	<30	52	
07/14/93	20	–	–	–	–	–	–	220	<30	46	
08/11/93	20	–	–	–	–	–	–	60	<30	54	
09/22/93	20	7.5	720	<0.5	9	13	161	100	<30	52	
12/08/93	21	7.4	726	<0.5	<5	10	151	50	<30	57	

TABLE H-2 (continued)

CONCENTRATIONS OF GROUND WATER MONITORING PARAMETERS
IN SAMPLES FROM BACKGROUND MONITORING WELL MW-1

Date	Quarter	pH[a]	Conductance[a] (μmhos/cm[2])	TOC[a] (mg/l)	TOX[a] (μg/l)	SO_4^{2-} (mg/l)	Cl^- (mg/l)	Fe (μg/l)	Mn (μg/l)	Na (mg/l)	TCE (μg/l)
03/10/94	22	7.5	730	<0.5	<5	10	150	200	<30	48	<0.5
06/22/94	23	7.5	740	<0.5	<5	15	150	150	<30	54	<0.5
09/14/94	24	7.4	750	<0.5	8	9	160	60	2.5	57	<0.5
12/14/94	25	7.5	770	<0.5	<5	10	150	80	4	51	<0.5
03/29/95	26	7.5	770	<0.5	<5	12	160	60	1.6	49	<0.5
06/27/95	27	7.4	760	<0.5	10	13	170	50	2.8	45	<0.5
09/12/95	28	7.5	780	<0.5	6	12	160	90	3	53	<0.5
12/08/95	29	6.9	780	<0.5	<5	12	180	<50	2.7	50	<0.5
03/20/96	30	7.4	770	<0.5	<5	13	180	<50	2.1	51	<0.5
06/26/96	31	7.7	760	<0.5	<5	13	150	<50	2.1	53	<0.5

[a]Each value reported before 06/09/93 is the average result from four replicate samples. Beginning 06/09/93, reported values are for a single sample as replicate sampling was stopped.
[b]Samples from 01/27/88, 07/29/88, 08/15/88, and 10/04/88 reported TCE at <5 μg/l.
[c]The replicates included a portion with results below the detection limit. The average was calculated after assigning a value of one-half the detection limit for the samples below the detection limit.
[d]Not sampled because water elevation dropped below elevation of sampling pump intake.

TABLE H-3

CONCENTRATIONS OF GROUND WATER MONITORING PARAMETERS
IN SAMPLES FROM BACKGROUND MONITORING WELL MW-3

Date	Quarter	pH[a]	Conductance[a] (μmhos/cm[a])	TOC[a] (mg/l)	TOX[a] (μg/l)	SO_4[a] (mg/l)	Cl (mg/l)	Fe (μg/l)	Mn (μg/l)	Na (mg/l)	TCE (μg/l)
10/04/88[b]	1	7.48	699	<3	361.25	73					<5
01/25/89	2	7.73	664	<3	<100	74					
04/17/89	3	7.3		<3	<100	9					
07/27/89	4	7.5	661	<3	<100	65					
10/31/89	5	7.53	617	<3	<100	68	35				
01/25/90	6	7.18	641	7.1[c]	<100	74	36				
04/17/90	7	7.33	590	<4	<20	60	46				
07/17/90	8	8.23	589	<4	<20	67	39				
10/18/90	9	7.63	642	0.7[c]	<100	15	34				
01/29/91	10	7.28	656	2.2	<5	80	54				
04/23/91	11	7.55	629	2.0	<5	77	34				
07/19/91	12	7.23	633	1.3	<5	85	45				
10/09/91	13	7.65	642	<0.5	<5	34	37				
03/13/92	14	7.45	648	0.6	3.3[c]	85	33				
04/21/92	15	7.5	644	<0.5	<5	81	37				
07/29/92	16	7.55	643	0.34[c]	<5	74	33				
10/20/92	17	7.55	641	<0.5	<5	67	34				
01/27/93	18	7.6	640	<0.5	<5	69	30				
06/09/93	19	7.6	627	<0.5	<5	70	28	50	<30	48	
07/14/93	20	–	–	–	–	–	–	<50	<30	44	
08/11/93	20	–	–	–	–	–	–	<50	<30	50	
09/22/93	20	7.4	630	<0.5	<5	87	37	<50	<30	50	
12/08/93	21	7.4	627	<0.5	<5	72	35	<50	<30	54	

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TABLE H-3 (continued)

CONCENTRATIONS OF GROUND WATER MONITORING PARAMETERS
IN SAMPLES FROM BACKGROUND MONITORING WELL MW-3

Date	Quarter	pH[a]	Conductance[a] (µmhos/cm²)	TOC[a] (mg/l)	TOX[a] (µg/l)	SO_4^{2-} (mg/l)	Cl^- (mg/l)	Fe (µg/l)	Mn (µg/l)	Na (mg/l)	TCE (µg/l)
03/10/94	22	7.4	620	<0.5	<5	74	31	<50	<30	47	<0.5
06/22/94	23	7.6	630	<0.5	8[d]	71	29	<50	<30	53	<0.5
09/14/94	24	7.5	630	<0.5	<5	80	31	<50	0.7	52	<0.5
12/14/94	25	7.5	630	<0.5	<5	69	28	<50	<1	48	<0.5
03/29/95	26	7.7	620	<0.5	7	71	28	<50	0.8	49	<0.5
06/27/95	27	7.6	620	<0.5	7	76	32	<50	0.6	53	<0.5
09/12/95	28	7.6	620	<0.5	<5	73	34	<50	<1	53	<0.5
12/06/95	29	7.5	620	<0.5	<5	77	29	<50	<0.5	54	<0.5
03/20/96	30	7.6	610	<0.5	<5	91	35	<50	<0.5	57	<0.5
06/26/96	31	7.9	600	<0.5	<5	78	31	<50	3.3	61	<0.5

[a]Each value reported before 06/09/93 is the average result from four replicate samples. Beginning 06/09/93, reported values are for a single sample as replicate sampling was stopped.
[b]Samples from 02/17/88, 05/27/88, 07/19/88, 08/15/88, and 10/04/88 reported TCE at <5 µg/l.
[c]The replicates included a portion with results below the detection limit. The average was calculated after assigning a value of one-half the detection limit for the samples below the detection limit.
[d]Duplicate sample analytical result also 8 µg/l.

TABLE H-4

TOLERANCE LIMIT CALCULATIONS

	pH	Conductance	TOC	TOX	Chloride	Sulfate	Iron	Manganese	Sodium
Σ x	458.4	38,108	54.34	865.2	4,389	2,502	1,845	237.7	1,546
n (number of samples)	61	59	61	60	53	61	30	30	30
$\overline{x}$ (mean)	7.51	646	0.89	14.4	82.8	41.0	61.5	7.9	51.5
s (sample standard deviation)	0.20	69.84	1.07	20.11	53.80	31.49	61.47	6.68	3.77
k (from tables)	2.33	2.02	2.01	2.02	2.05	2.01	2.22	2.22	2.22
Upper Tolerance Limit[a]	7.98	787	3.06	55.0	193	104	198	23.0	59.9
Lower Tolerance Limit[b]	7.05								

[a]Upper Tolerance Limit = $\overline{x} + ks$.
[b]Lower Tolerance Limit = $\overline{x} - ks$.

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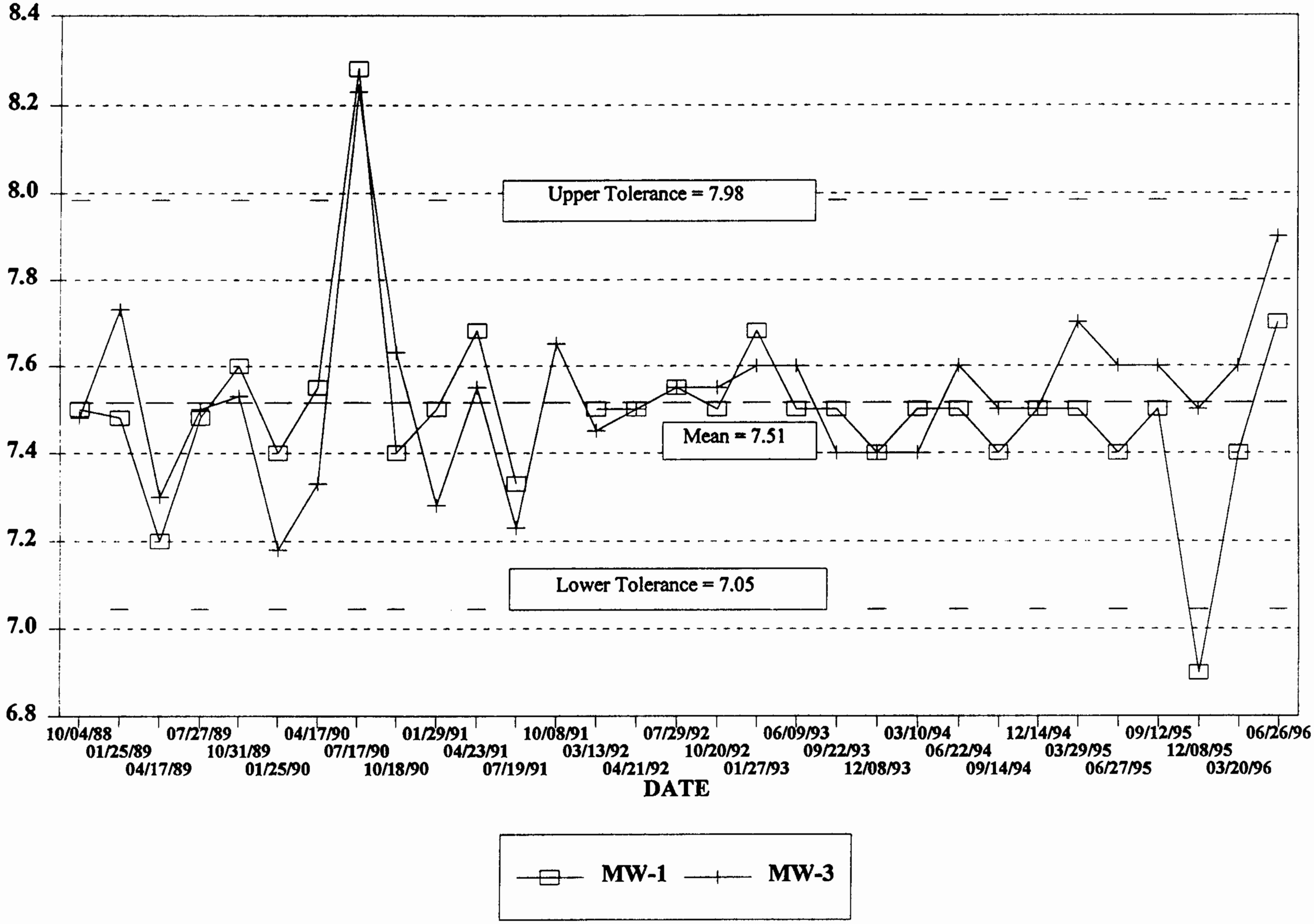
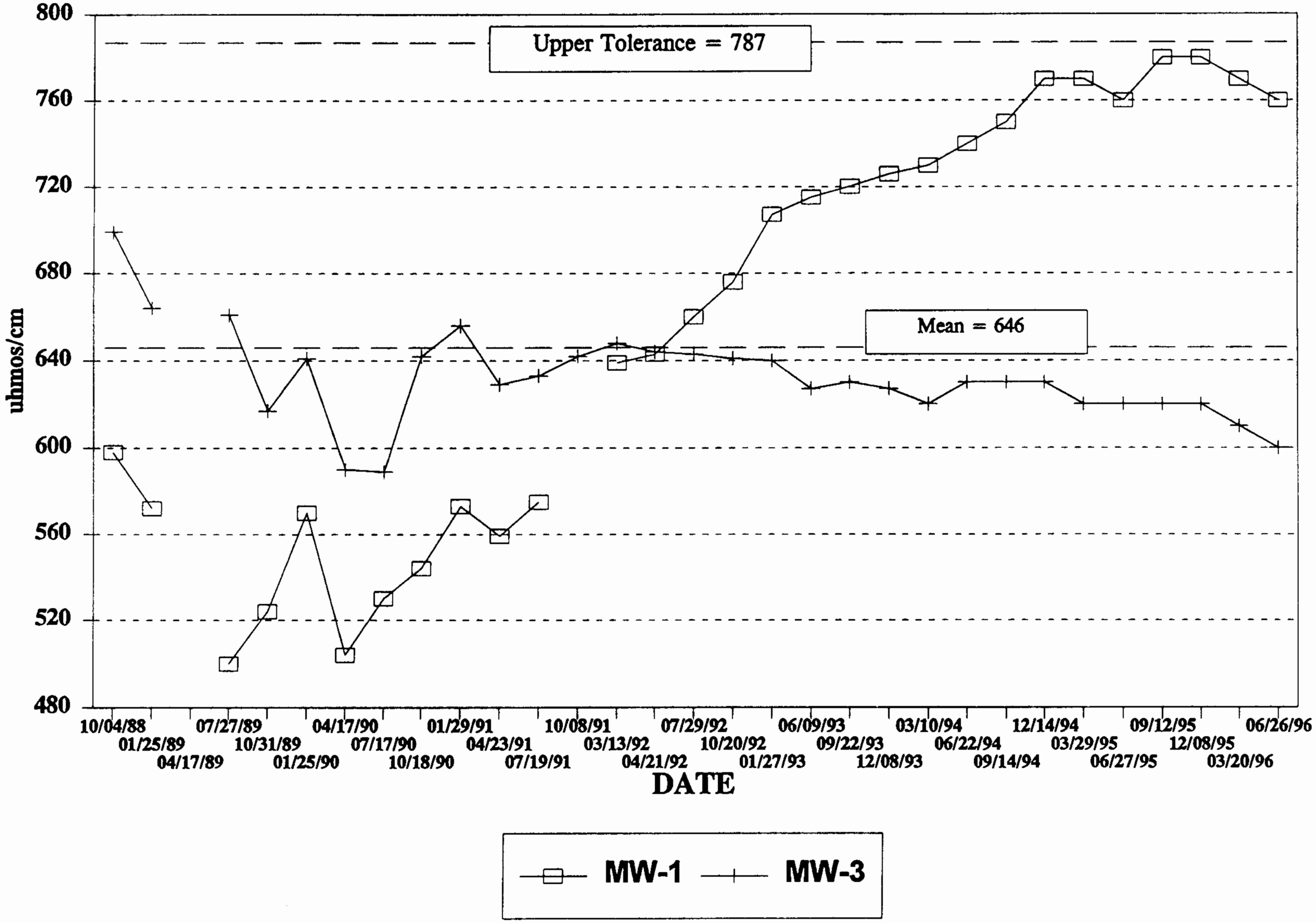
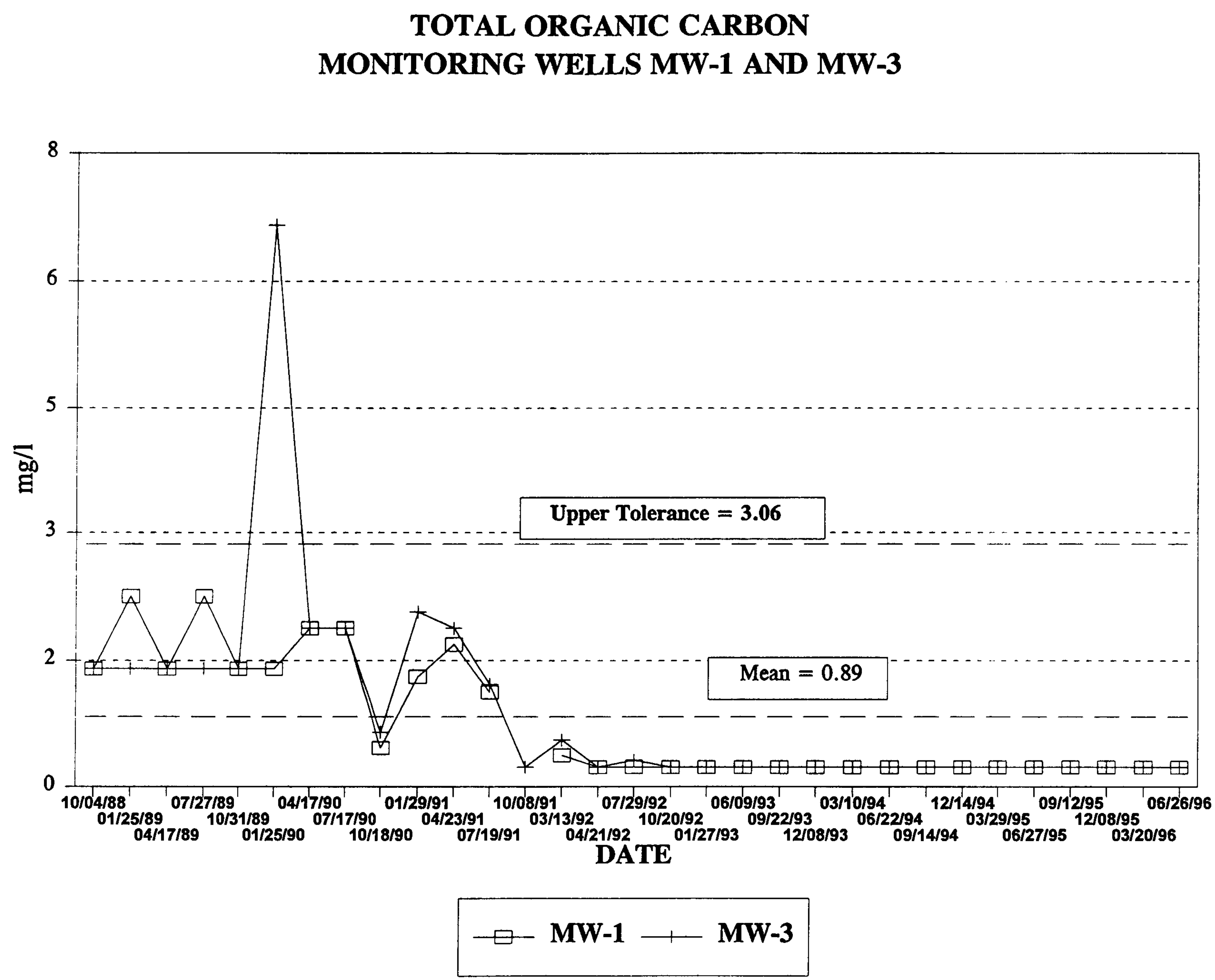
pH
MONITORING WELLS MW-1 AND MW-3

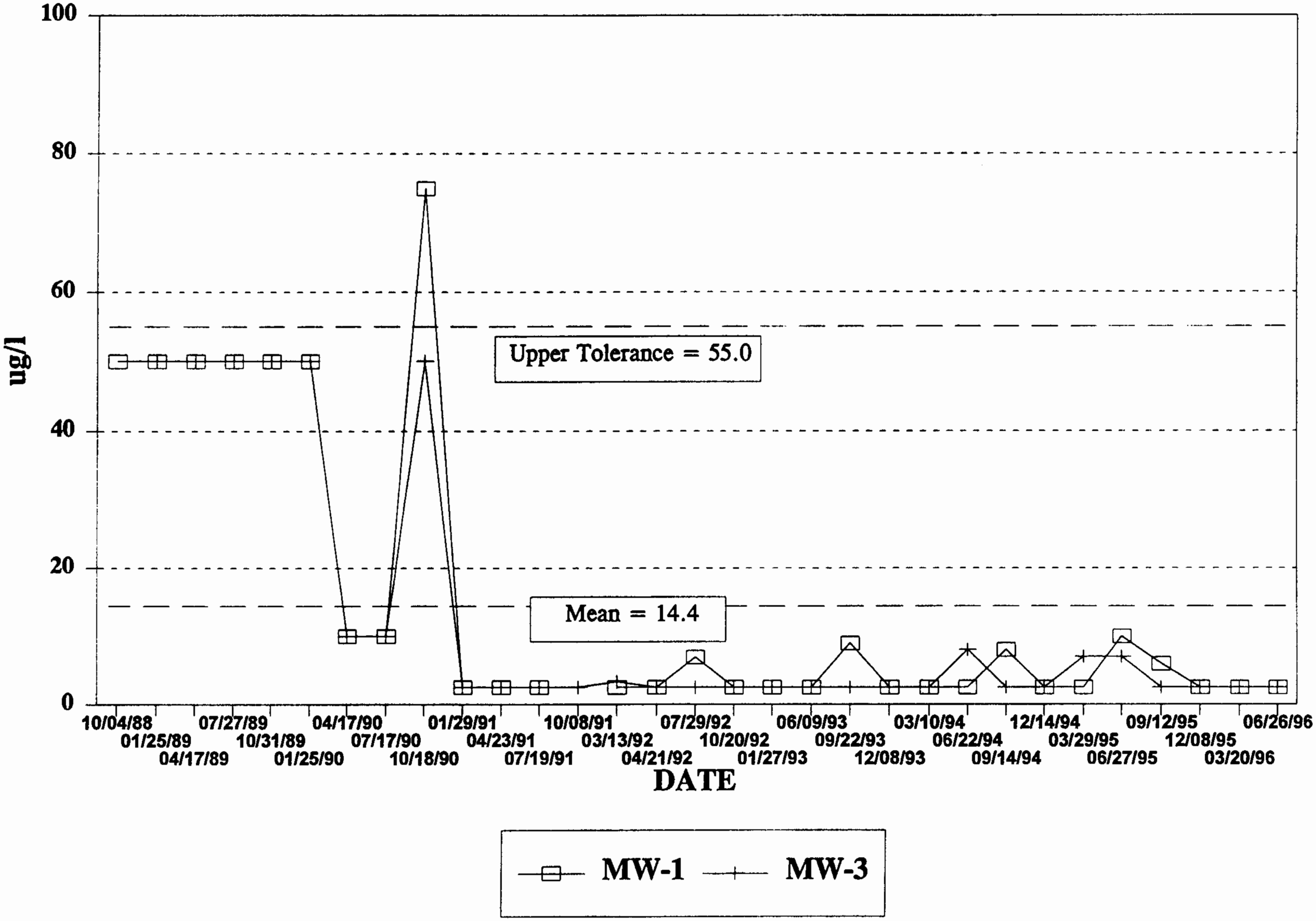


SPECIFIC CONDUCTANCE
MONITORING WELLS MW-1 AND MW-3

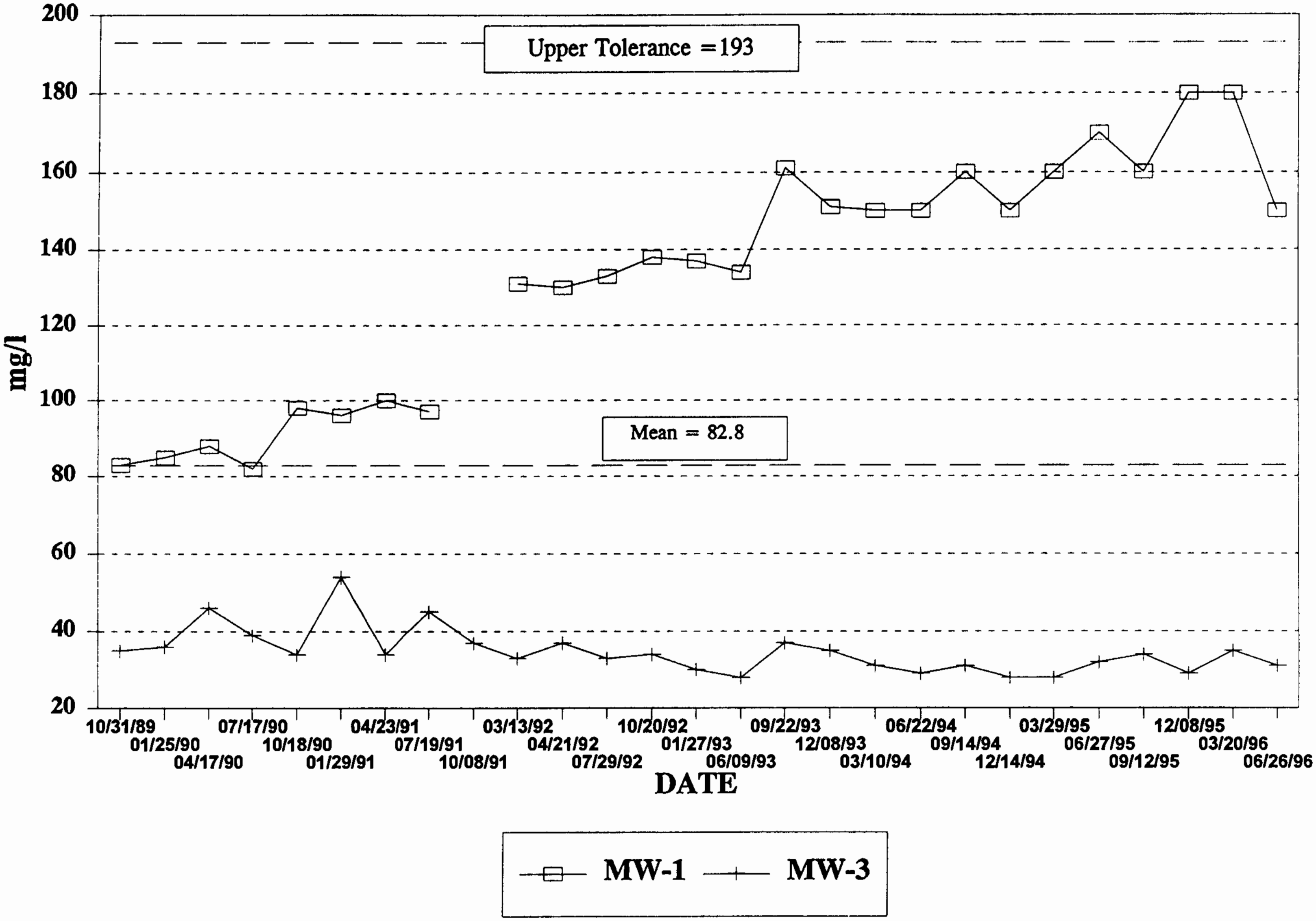



TOTAL ORGANIC CARBON
MONITORING WELLS MW-1 AND MW-3
8
6
5
3
2
0
mg/l
Upper Tolerance = 3.06
Mean = 0.89
10/04/88
01/25/89
04/17/89
07/27/89
10/31/89
01/25/90
04/17/90
07/17/90
10/18/90
01/29/91
04/23/91
07/19/91
10/08/91
03/13/92
04/21/92
07/29/92
10/20/92
01/27/93
06/09/93
09/22/93
12/08/93
03/10/94
06/22/94
09/14/94
12/14/94
03/29/95
06/27/95
09/12/95
12/08/95
03/20/96
06/26/96
DATE
MW-1
MW-3

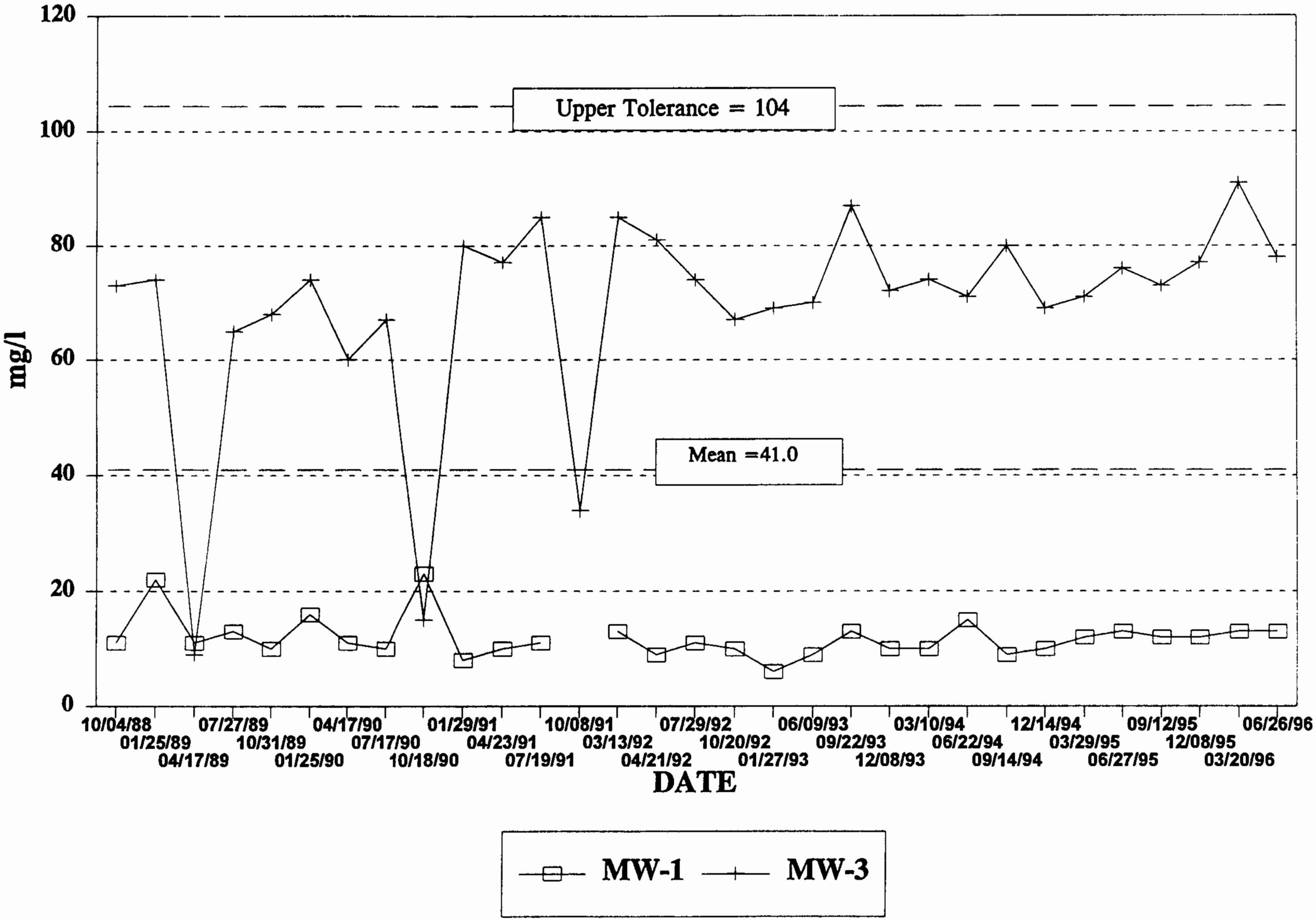
TOTAL ORGANIC HALOGENS
MONITORING WELLS MW-1 AND MW-3



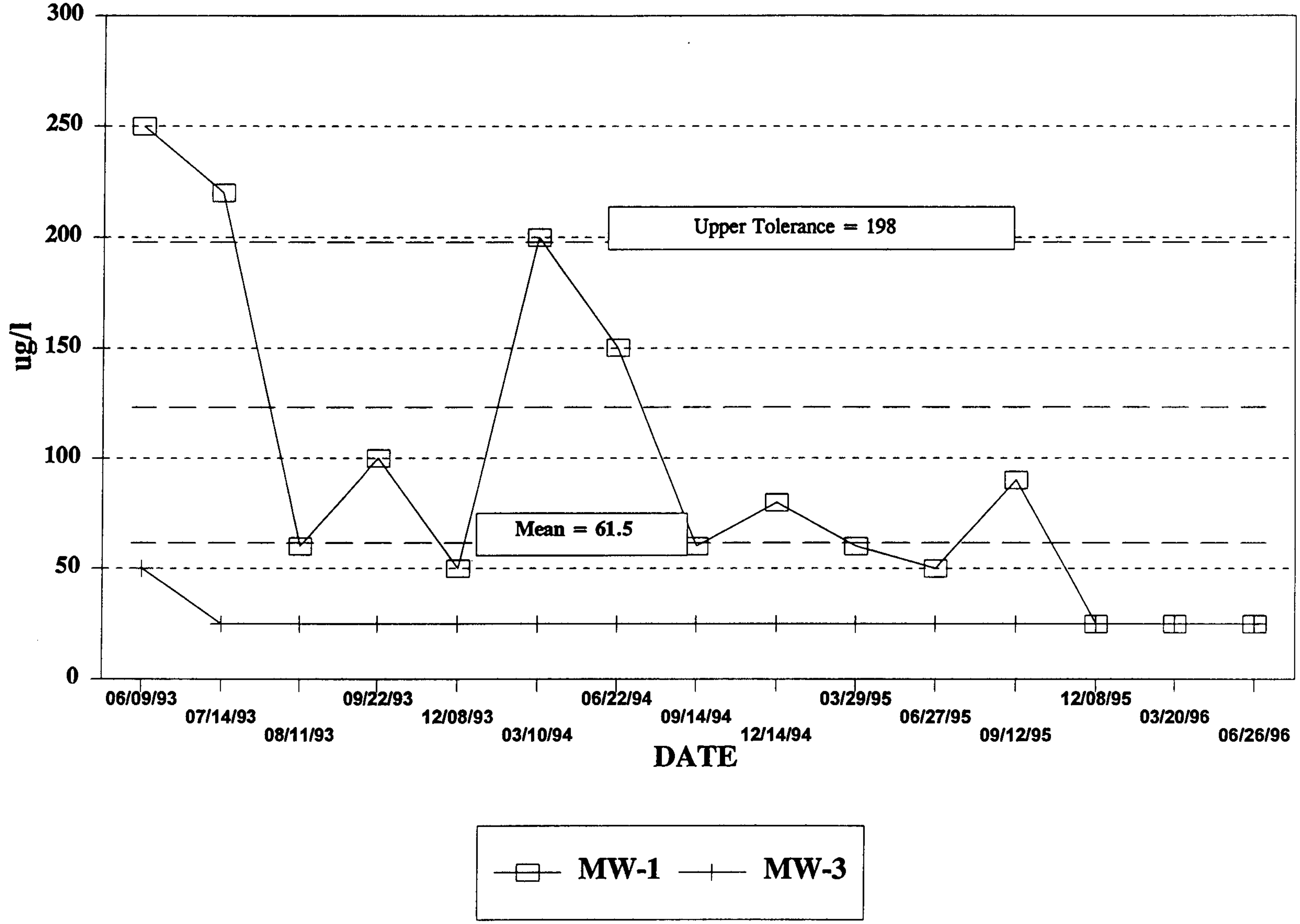
CHLORIDE
MONITORING WELLS MW-1 AND MW-3



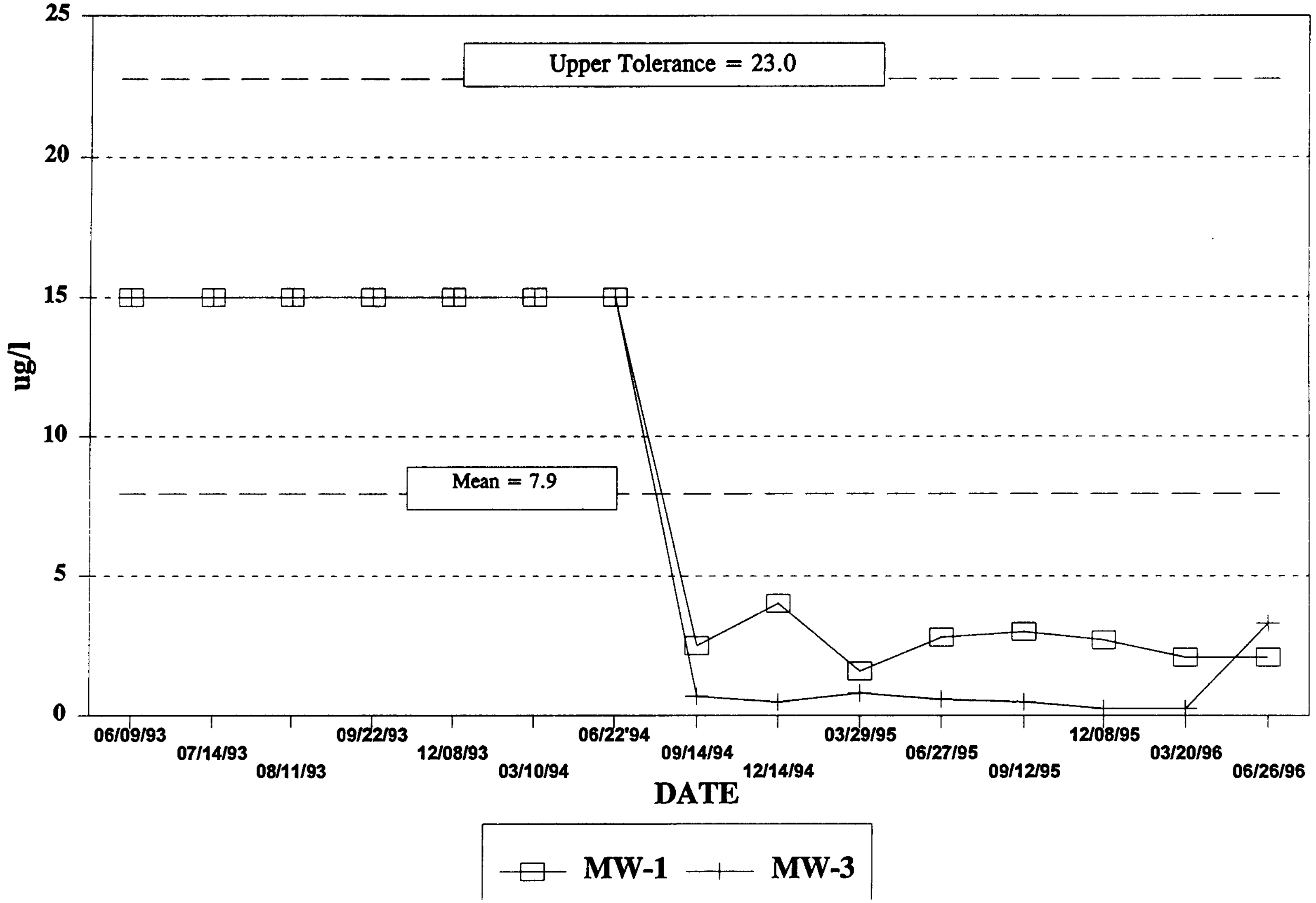
SULFATE
MONITORING WELLS MW-1 AND MW-3



IRON
MONITORING WELLS MW-1 AND MW-3



MANGANESE
MONITORING WELLS MW-1 AND MW-3



SODIUM
MONITORING WELLS MW-1 AND MW-3